"COMPARISON BETWEEN MICROSURGICAL AND MACROSURGICAL TECHNIQUES FOR THE TREATMENT OF GINGIVAL RECESSIONS USING CORONALLY ADVANCED FLAP AND PLATELET RICH FIBRIN - A RANDOMIZED CONTROLLED CLINICAL TRIAL"

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This is to certify that the dissertation ***"Comparison between microsurgical and macrosurgical techniques for the treatment of gingival recessions using coronally advanced flap and platelet rich fibrin - A randomized controlled clinical trial"*** *is a bonafide research work done by* ***REG NO. IK0221004****.*

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I, ***REG NO. IK0221004*** , a postgraduate student in Dept of Periodontics, have completed my research work on the topic ***"Comparison between microsurgical and macrosurgical techniques for the treatment of gingival recessions using coronally advanced flap and platelet rich fibrin - A randomized controlled clinical trial"*** in the year 2021-2024.

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LIST OF ABBREVIATIONS

SR. NO.	ABBREVATIONS	FULL FORM
1	%	Percentage
2	i.e.	That is
3	Mm	Millimetre
4	No.	Number
5	Sr.	Serial
6	mRC	Mean root coverage
7	RC	Complete root coverage
8	RCT	Randomized controlled trials
9	SD	Standard deviation
10	MD	Mean Difference
11	GR	Gingival recession
12	CEJ	Cemento-enamel junction
13	CAF	Coronally advanced flap
14	GTR	Guided tissue regeneration
15	EMD	Enamel Matrix Derivative

16	FGG	Free Gingival Graft
17	SCTG	Sub-epithelial Connective Tissue Graft
18	GI	Gingival index
18	HGR	Height of Gingival Recession
19	RCAL	RelativeClinical attachment level
20	TKT	Thickness of Keratinized Tissue
21	GI	Gingival index
22	WKT	Width of keratinized tissue
23	VAS	Visual analogue scale
24	OM	Operating microscope
25	HI	Healing Index
26	PRF	Platelet Rich Fibrin
27	ADM	Acellular Dermal Matrix
28	PC	Platelet Concentrates
29	CTG	Connective Tissue Graft
30	PDGF	Platelet-derived growth factor
31	fGF	fibroblast derived growth factor

32	tGT-beta	Transforming growth factor -beta
33	EGF	Epidermal growth factor
34	i-GF-1	Insulin-like growth factor
35	PPS	Periodontal plastic surgery
36	LPF	Lateral positioned flap
37	GTT	Gingival tissue thickness
38	AG	Attached gingiva
39	KMW	Keratinized mucosa width
40	IOPA	Intra oral peri-apical radiograph
41	PD	Periodontal disease
42	CP	Clinical parameters
43	UNC-15	University of North Carolina -15
44	LA	Local Anesthesia
45	MGJ	Muco-gingival junction
47	CHX	Chlorhexidine
48	SC	Stem cells

ABSTRACT

INTRODUCTION: Gingival recession is a prevalent aesthetic concern among patients, with an increased susceptibility leading to a greater risk of root caries. Restoring the periodontium to health is the aim of periodontal plastic surgery. Coronally Advanced Flap (CAF) has been the technique of choice for treatment of isolated gingival recessions. The combination of platelet rich fibrin along with CAF has shown beneficial effects in treatment of gingival recession. New surgical approaches are necessary to minimize the surgical trauma and overcome the limitations related to the manual ability and natural vision of the surgeons. The incorporation of a surgical microscope to periodontal plastic surgery provides better illumination and adequate magnification to increase the precision of a surgeon's surgical skill. Hence, the present study was undertaken to compare the clinical efficacy of macro-surgically and micro-surgically treated coronally positioned flap technique with platelet rich fibrin membrane for the treatment of Miller's class I gingival recessions.

AIM: To assess and compare the macro and microsurgical techniques using a coronally advanced flap and platelet rich fibrin for the treatment of Miller's class-1 gingival recession.

MATERIALS AND METHODS: Twenty-two sites with millers class I gingival recessions. Total sites of treatment were randomized into two groups using a computer-generated randomization method. Test group (Group - A) comprised 11 sites treated by microsurgically treated coronally advanced flap with platelet rich fibrin and Control group (Group - B) comprised 11 sites treated by macrosurgically treated coronally advanced flap with platelet rich fibrin. All the clinical parameters

GI,HGR, PD, CAL, WKT and TKT were evaluated at baseline, 1month and 3 months after the surgery and HI,VAS scores were evaluated posturgically,3rd and 7th day post operatively.

RESULTS: Intra group comparison showed statistically significant improvement in all clinical parameters in both the groups. On inter group comparison the clinical efficacy of additional microsurgical approach to root coverage in Millers class I gingival recession using coronally positioned flap and platelet rich fibrin showed a statistically significant increase in WKT and TKT and offered less postoperative pain and discomfort when compared to macro-surgically treated coronally positioned flap and platelet rich fibrin.

CONCLUSION: Use of magnifying tools like surgical loupes along with microsurgical instruments and sutures aids in improvement in clinical outcomes (WKT & TKT) and in aesthetically accepted outcomes with less postoperative morbidity.

KEYWORDS: Gingival recession, Coronally Advanced Flap (CAF), Platelet Rich Fibrin (PRF), Micro-surgery, Macro-surgery.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF GRAPHS

LIST OF ANNEXURES

INTRODUCTION

"Gingival recession (GR)" is the denudation of the root surface brought on by the gingival tissue's apical migration to the CEJ. There are numerous etiologic and contributing variables associated with GR, encompassing aberrant frenum and muscle attachments, malpositioned teeth and trauma from tooth brushing. GR is a clinical condition that is often common and can cause aesthetic concerns, insufficient plaque control, root caries, and dentin hypersensitivity.[1]

Several periodontal plastic surgical (PPS) techniques have been recommended for treating isolated GR, with the main aim being to achieve full root coverage.The conventional procedures used for RC are based on displacement of the tissue which may either be by advancing (coronally advanced flap) or rotating the flaps (lateral pedicle graft and double papilla flap) or by grafting (FGG or by CTG). When tissue is taken from a donor site, it greatly increases the difficulty and the probability of complications throughout and after surgery. The advent of biologically active materials such as "Acellular Dermal Matrix" (ADM), "Enamel Matrix Derivative", "Platelet Rich Plasma", and "Platelet Rich Fibrin" has opened new avenues for achieving an end result comparable to autologous soft tissue grafts.[2]

The coronally advanced flap often serves as the basis for the majority of root-coverage treatments (CAF). Initially, teeth that are affected by periodontal disease were attached using coronally relocated flaps. Later, they underwent modifications to address gingival recession. Compared to rotating flaps, the coronally advanced flap is less technique-sensitive. Additionally, it reduces donor area morbidity and does away with the necessity to harvest donor tissue. Pini-Prato et al. introduced the phrase "coronally advanced flap" in 1999 to more accurately describe the surgery. It has been

demonstrated that CAF achieves root coverage predictably. Between 24% and 95% of sites acquire complete root coverage with this approach, with an average root coverage of between 75% and 82.7%. Histologically, CAF caused only little bone healing and the re-formation of epithelial and connective tissue connections.[3]

CTG with CAF method is recognized as the standard procedure for producing reliable treatment results, keratinized tissue gain, and RC. Nevertheless, this approach comes with several limitations. These include inadequate thickness of donor tissue, increased risk associated with using a secondary surgical site, prolonged recovery duration, proximity of the palatal neurovascular bundle to the premolar-molar region, and insufficient donor site to support large grafts, particularly in cases with multiple defects or extensive recession areas. Additionally, postoperative pain and excessive bleeding have been noted. Hence, the interest in treating GRs using alternate techniques.[4]

Products that aid in wound healing are becoming more popular in dentistry. In this regard, the use of platelet preparations, by using it alone or in conjunction with other biomaterials, has emerged in recent years as an effective restorative approach. In reality, platelets are a source of growth factors, not only crucial for hemostasis but also for the healing process. In addition, it has been demonstrated in the past ten years that the use of autologous non-transfusion blood components promotes faster and better epithelialization as well as more vascularized connective tissue at wound healing sites.[5]

The latest advancements in techniques for root coverage have focused on additional treatments such as platelet concentrates (PCs) to accelerate the process of wound healing and restoration. The application of platelet concentrates can release

five key growth factors (GFs) – PDGF, FGF, transforming GF-beta, EGF, and insulin-like GF-I. These GFs have the potential to promote tissue regeneration and enhance the healing process when applied topically. Platelets and blood plasma contain the majority of these GFs. Hence, platelets have been widely utilized in both dental and medical domains. Platelet-Rich Plasma is acknowledged as a mediator containing various GFs in the initial generation of platelet concentrates. More recently, researchers have introduced Concentrated Growth Factors and PRF.[5]

The addition of PRF with the CAF has demonstrated advantageous effects in addressing gingival recession. [6] Li R et al (2019) reviewed to assess the supplementary effects of multiple types of PC to CAF treating GR and studies concluded that PRF could exert additional beneficial effects to CAF when compared to other platelet concentrates.[7] PRF is composed of - cytokines, glycemic chains, structural glycoproteins contained within a polymerizing fibrin network.[8] These constituents have been demonstrated to synergistically promote healing by boosting the regenerative capabilities of both bone and soft tissues. Consequently, PRF was employed in combination with CAF in the present study.[9]

With advancements in techniques and materials, it becomes essential to adopt new surgical methods that minimize injury and address the constraint related to surgeons' skills and natural vision.[10] Incorporating a surgical microscope in PPS offers improved illumination and magnification, enhancing a surgeon's precision during the procedure.[11] Consequently, microsurgical techniques have been advanced to reduce tissue injury and enable healing by primary intention.[12] Numerous studies have highlighted that utilizing an operating microscope enhances visual clarity, allowing for more precise and careful handling of mucosal and bone tissues. This enhanced accuracy enhances access during surgery, reduces unnecessary tissue removal,

optimizes debridement of defects and root surfaces, improves flap mobility, and encourages improved blood supply to the area. As a result, achieving superior primary wound closure with reduced morbidity and discomfort, along with precise incision lines and smaller surgical wounds, provides better aesthetic outcomes.[13]

Therefore, the purpose of this study was to evaluate and correlate between the clinical efficacy of the CAF technique combined with a PRF in treating "Miller Class I gingival recessions", using both macro-surgical and micro-surgical approaches.

AIM AND OBJECTIVES

Aim:

To assess and compare the macro and microsurgical techniques using a CAF and PRF for treating “Miller’s class-1 gingival recession”.

Objectives:

1. To assess the percentage of sites showing maximum RC with CAF and PRF using microsurgical technique.
2. To assess the percentage of sites showing maximum RC with CAF and PRF using macro surgical technique.
3. To compare the percentage of sites showing maximum RC using CAF and PRF in the macro and microsurgical techniques.
4. To evaluate and compare tissue healing and pain using healing index and visual analog scale in the macro surgical and micro surgical group.

REVIEW OF LITERATURE

Mucogingival surgery was the previous name for periodontal plastic surgery.[14] Since 1950, Friedman has introduced mucogingival surgery in periodontal literature. Structural irregularities in the soft tissues can expedite the advancement of PD or impede the efficacy of treatment. Mucogingival surgery encompasses periodontal surgical procedures aimed at rectifying defects in the morphology, location, or enhancement of dental junction to address these issues.[15]

Miller, in 1988, proposed "periodontal plastic surgery" would be suitable, as mucogingival surgery had evolved beyond its traditional scope by the 1990s, encompassing a wider array of procedures aimed at addressing various defects and enhancing soft tissue aesthetics. This terminology shift was officially endorsed by the World Workshop on Clinical Periodontics in 1996.[16]

GR is characterized by the shift of marginal tissue below the CEJ. As the marginal tissue may comprise alveolar mucosa, the term “marginal tissue recession” is often considered more precise than “gingival recession.” This condition is common among individuals with inadequate oral hygiene practices and can manifest at various ages, sometimes starting early in certain demographics. GR is a frequently encountered clinical issue that can lead to aesthetic concerns, difficulties in maintaining proper plaque control, as well as the development of root caries and dentin hypersensitivity.[17]

Various techniques have been employed to address isolated gingival recessions. The primary objective of these PPS methods is to achieve both RC and an aesthetically pleasing outcome, along with the integration of mucosa and/or gingiva. Over the past 30 years, a range of surgical approaches have been utilized to

manage gingival recession defects. These encompass procedures such as the LPF and CAF. FGG , “subepithelial connective tissue graft”, GTR using membranes, “acellular dermal matrix , PRF . The majority of root-coverage techniques typically rely on the CAF . The combination of PRF with CAF has demonstrated favorable outcomes in the treating gingival recession.[18, 19]

Periodontal surgical techniques have evolved significantly, with a growing preference for minimally invasive procedures that prioritize patient comfort. The focus is on achieving root coverage for aesthetic enhancement and improved comfort. In pursuit of these goals, periodontal microsurgery has emerged, employing microscopes and specialized instruments to enhance visual clarity, thereby reducing surgical trauma and postoperative discomfort.[20]

CORONALLY ADVANCED FLAP:

Following its introduction to the realm of periodontics, the CAF quickly gained popularity among practitioners as a method for achieving root coverage. This technique entails shifting the margins of the flap coronally to conceal the visible portion of the root surface. The outcome of the procedure largely depends on the skill and accuracy of the operator, given that the details of the technique significantly affects the final result.[21]

Akcan SK et al (2020).[22] Conducted a study on GR treatment with CAF in combination with CGF and in combination with CTG, concluded that connective tissue graft is superior to CAF with CGF in the improvement of clinical parameters.

Singh SK, Sharma N, Malhotra S, Dodwad V, Vaish S, Singh DK (2017).[23] The study compared a modified CAF technique with and without magnification for treating localized GR. Surgical procedures were performed with 3.5x magnification at the GroupA and without magnification at the GroupB. Twenty sites with "Miller's Class I GR" were included (10 each in the test,control group). Outcomes were assessed at baseline, 3 months post-surgery, and VAS scores were recorded on the 3rd, 7th days after surgery. Microsurgery resulted in significantly reduced post-op pain and discomfort when correlated to the macrosurgical approach.

Zucchelli G, Stefanini M, Ganz S, Mazzotti C, Mounssif I, Marzadori M (2016).[24] This study conducted a parallel double-blind RCT to compare a modified triangular CAF with a trapezoidal CAF in treating "Miller Class I and II GR". Fifty cases were treated, with 25 receiving each technique. Clinical and aesthetic evaluations were done at 3, 6, 12 months post-surgery. No noticeable changes were found in recession reduction, root coverage, or aesthetic scores between the two CAF groups. Patients reported better aesthetics at 3 months with the triangular CAF, while the periodontist noted improved root coverage and color match. However, the trapezoidal CAF was associated with more keloid formation. Both techniques are effective, but the triangular CAF is preferable for patients seeking enhanced aesthetics.

CORONALLY ADVANCED FLAP WITH PLATELET RICH FIBRIN:

Dixit N, Lamba AK, Faraz F, Tandon S, Aggarwal K, Ahad A (2018).[25] The study included 12 patients with "Miller's Class I and Class II gingival recession" in non-adjacent anterior teeth, each with at least 3 mm of AG . Using a split-mouth study, 1 tooth received modified CAF, while the other had CAF with PRF.

Evaluations were done at baseline, 1 month, 3 months, 6 months post-treatment. The combined technique, notably the augmented gingival thickness, validates the use of PRF + CAF.

Kumar A, Bains VK, Jhingran R, Srivastava R, Madan R, Rizvi I et al (2017),[26] This study assessed PRF and CTG with CAF in treating gingival recession using a microsurgical approach. Group I (PRF and CAF) showed highest patient satisfaction, while Group II (CAF and CTG) had increased gingival thickness. Further long-term research is needed to compare PRF, CTG, and CAF alone comprehensively.

Moraschini V, Barboza ED (2016),[27] A review evaluated PRF membrane effects on GR clinical outcomes, searching articles up to June 2015 in four databases and journals.Eligible studies included RCTs and prospective CT's with a 6-month period comparing PRF to other biomaterials for treating "Miller Class I or II gingival recession (GR)". The review encompassed six RCTs and one prospective clinical trial. Subgroup analysis revealed no significant differences in RC or CAL between groups. However, the subgroup treated with CTG showed a significantly greater gain in KMW (P = 0.04). Overall, the meta-analysis indicated that PRF did not improve remaining parameters "Miller Class I and II gingival recession" compared to other treatments.

Gupta S, Banthia R, Singh P, Banthia P, Raje S, Aggarwal N et al (2015),[28]

The study compared the effectiveness of the CAF procedure alone and against CAF along with PRF in treating "Miller's class I and II gingival recessions". Among 30 sites with these recessions were split into test group (CAF+PRF, 15 sites) and control group (CAF alone, 15 sites) among 26 subjects, Clinical measures were assessed

before surgery, and then at 3 months , 6 months following the operation. 2 groups showed noticeable improvement in all the measured outcomes at the 3, 6month follow-ups, except for GTT, which did not change notable in the Group- B at 3 months. Thus, incorporating PRF with the CAF procedure did not provide added benefits like RC for "Miller's class I and II recessions".

Thamaraiselvan M, Elavarasu S, Thangakumaran S, Gadagi JS, Arthie T et al (2015),[29] The study aimed to determine if adding PRF to CAF would enhance clinical outcomes in treating isolated GR. Twenty healthy individuals with “Miller's class I or II BR” defects were alloted to either the group A (CAF alone) or the group B “(CAF + PRF)”. Clinical outcomes were evaluated by assesing specific outcomes before surgery, at 3 months, 6 months post-op.

The study found no notable differences between the groups overall, although there was a noticeable increase in GTH in the test group, which was statistically significant. Thus, CAF was considered an effective treatment for the “Miller's class I and II recession” . However, inclusion of PRF along with CAF did not offer addded benefits in terms of RC, except for the observed improvement in GTH.

Eren G, Atilla G (2014),[30] The study's objective was to assess PRF's clinical efficacy alongside CAF for treating localized GR. 22 pts with “Miller Class I or II GR” were involved in a split-mouth study , totaling 44 defects treated with either CAF+PRF (test) or CAF with SCTG (control). Outcome measures were evaluated before surgery and after 6 months.

Using standardized photographs and digital measuring method, RD, RW, RA, and KTW were measured. However, no notable difference was found among the groups ($p>0.05$). The study concludes that both CAF+PRF and CAF+SCTG

treatments were effective for localized gingival recessions. Moreover, the digital measuring method proved highly accurate and precise in evaluating treatment outcomes for both procedures.

Jankovic S, Aleksic Z, Klokkevold P, Lekovic V, Dimitrijevic B, Barrie Kenney E, Camargo P et al (2012),[31] A 6-month RCT aimed to compare PRF versus CTG outcomes in treating GR and evaluate PRF's impact on initial wound healing and discomfort to the patient. PRF membrane usage in GR treatment showed favorable CO , improved WH, and reduced discomfort to the patient correlate to CTG. Although both PRF and CTG were similarly effective in treating GR, CTG resulted in greater keratinized tissue width increase, while PRF demonstrated superior wound healing.

CORONALLY ADVANCED FLAP WITH MICRO AND MACRO SURGICAL TECHNIQUES:

Patel C, Mehta R, Joshi S, Hirani T, Joshi C (2018).[32] 10 patients with bilateral isolated GR, classified as "Miller's Class I or Class II recession", were comprised in the study. The research used a split-mouth study, with a caf procedure accompanied by prf placement in the microsurgical and conventional procedures. Clinical measures were evaluated before surgery, 3 months, 6 months postoperatively.

The visual analog scale scores differed significant among groups, but there were no notable improvement in other clinical measures among the groups at 3,6 months.The use of a microscope facilitated a less traumatic and minimally invasive procedure, leading to notable improvements in clinical parameters in both groups.

Nizam N, Bengisu O, Sönmez Ş et al (2015),[33] The study compared microsurgical(group-1) and macrosurgical(group-2) techniques for treating GR with connective tissue grafts. It involved 21 teeth in each group and assessed various parameters over 24 months, including RD, RW, RSA, KTW, PD, CAL, pain during healing, and aesthetics. Both techniques showed significant improvements in RD, RW, and RSA at multiple time points. Pain decreased faster in the minimal invasive surgical group, while aesthetics improved in both groups. The study suggests that microsurgery may sustain better clinical outcomes for up to 24 months, with faster healing, though aesthetics were comparable.

MATERIALS AND METHODS

SOURCE OF DATA

A comparative RCT over 3 months was carried out to assess the outcomes of RC obtained by using macro surgically and micro-surgically treated CAF with PRF. Participants were enlisted from the outpatient department, "Department of Periodontics, KLE VK Institute of Dental Sciences, Belagavi, Karnataka". Prior to the study initiation, the participating individuals were provided written consent forms. The study protocol was granted ethical approval by the institution.

Patients meeting the specified criteria were incorporated into the study.

Inclusion criteria:

1. Age : 18-50 years.
2. Subjects with "Miller's class I gingival recession".
3. Patient's in good overall health.
4. Teeth with no radiographic signs of bone loss.

Exclusion criteria:

1. Pregnant or breastfeeding women.
2. No medical conditions affecting periodontal treatment outcome.
3. Use of immunosuppressive agents.
4. Patients on antibiotics or anti-inflammatory drugs in the past 3 months.
5. Current and former smokers.
6. History of periodontal surgery in that area in the past 6 months.

STUDY DESIGN:

11 subjects with 22 sites of Miller's Class I GR were selected. They were split into 2 groups by computer generated randomization. The groups were as follows:

- Group A - Localized Millers "Class-I gingival recession" treated Micro surgically with CAF + PRF.
- Group B - Localized Millers "Class-I gingival recession" treated Macro surgically with CAF + PRF.

STUDY PROTOCOL: Patients underwent a thorough examination conducted under adequate illumination using tools such as a mouth mirror, explorer, UNC-15 periodontal probe, tweezers, and cotton pellets. Upon meeting the specified selection criteria, patients were provided with detailed information regarding the potential treatment options, including their associated risks and benefits. Before the study commenced, all patients willingly provided informed consent. They also received detailed case history examinations and were counseled on the importance of maintaining good oral hygiene before undergoing non-surgical periodontal therapy.

As outlined in the study protocol, the following phases were adhered to:

Screening Visit: General, oral examination was done and written consent was taken from the patients. The sites of treatment were randomized into two groups using computer generated randomization, followed by making of alginate impressions and preparation of master cast was done. Acrylic stent was prepared on selected sites of master cast for the measurement of PPD , recession height, and RCAL for both control and test sites. Blood tests were conducted as part of the standard procedure for

all participants. IOPA of the involved teeth were taken to rule out any underlying bony pathology.

- **Baseline Visit:** Recording of all clinical parameters followed by scaling and root planning, reinforcement of oral-hygiene instructions. In patients with occlusal/incisal interference, selective grinding was done to relieve interference, confirmed by fremitus test.
- Surgical Phase
- Re-evaluation on the 1st post-operative day to assess any post-operative complications.
- Recall Phase: patients were subsequently re-evaluated 3 months after the surgery.

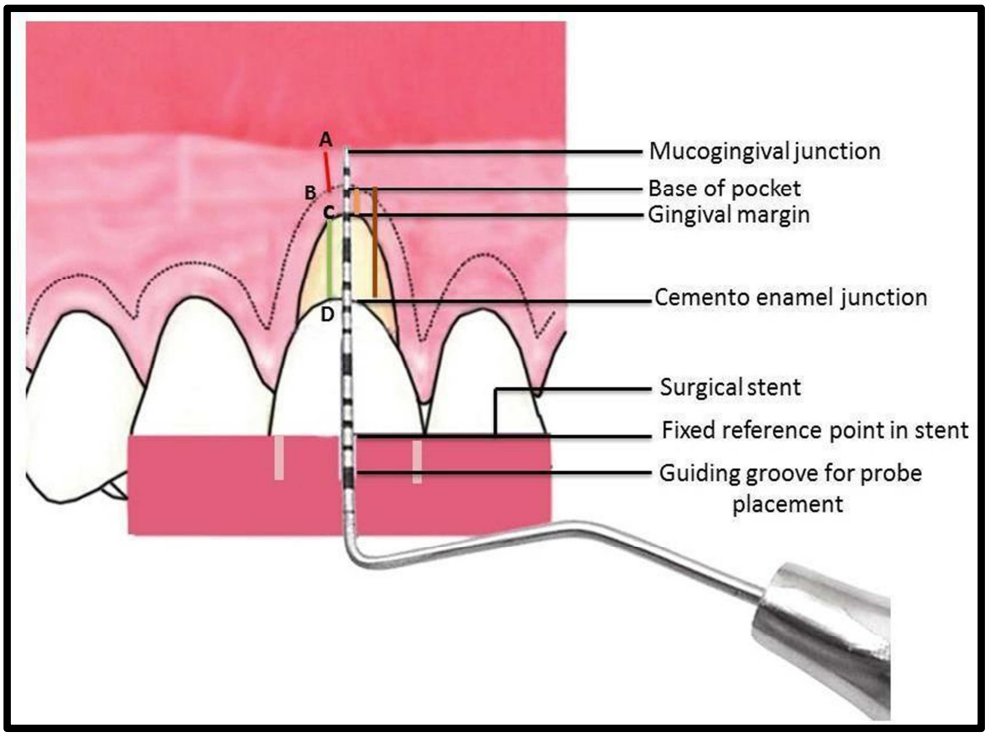
STENT PREPARATION[34]:

A personalized occlusal stent was created using cold-cure acrylic resin on cast-based models derived from an alginate impression. The stent was designed to place over the occlusal surface(OS) of the targeted tooth, including with the OS of adjacent teeth in the mesial and distal directions. Furthermore, it elongated downwards on the buccal and lingual aspects to envelop the upper one-third of the impacted teeth, incorporating grooves for uniform postoperative measurements.

CLINICAL PARAMETERS:

The CP were measured precisely to the nearest mm using the UNC 15 probe by an investigator at each evaluator site both prior to the surgery and then again at the 3-month. (Figure 2 ,6 & 8)

FIGURE 1: DIAGRAMATIC REPRESENTATION OF CLINICAL PARAMETERS



ASSESSMENT OF CLINICAL PAREMETERS:

1. Gingival Index (GI)
2. Height of gingival recession (HGR)
3. Probing depth (PD)
4. Relative clinical attachment level (RCAL)
5. Width of keratinized tissue (WKT)
6. Thickness of keratinized tissue (TKT)
7. Visual analog scale (VAS)
8. Healing Index (HI)

1. Gingival Index : (Loe H Silness -1963)[35]

Assessed on specified teeth (Index teeth-16,36,12,32,24,44) at specific gingival areas using a blunt probe

2. Height of gingival recession[36]

Recession height was recorded at the midfacial aspect of the recession defect from CEJ to gingival margin, using a UNC 15 probe at baseline and 6months. [Green line-CD in diagram, Figure 1].

3 . Probing depth[37]

Gingival sulcus depth is the measurement from the GM to the sulcus base measured with UNC 15 probe of the tooth, taken at baseline and 3 months. [Yellow line-BC in diagram, Figure 1].

4. Relative clinical attachment level[38]

The measurement, taken with a UNC 15 probe, records the distance from a set point in a stent to the pocket base, assessed at both baseline and 3 months.[Brown line-BD in diagram, Figure 1].

5. Width of keratinized tissue (WKT)[39]

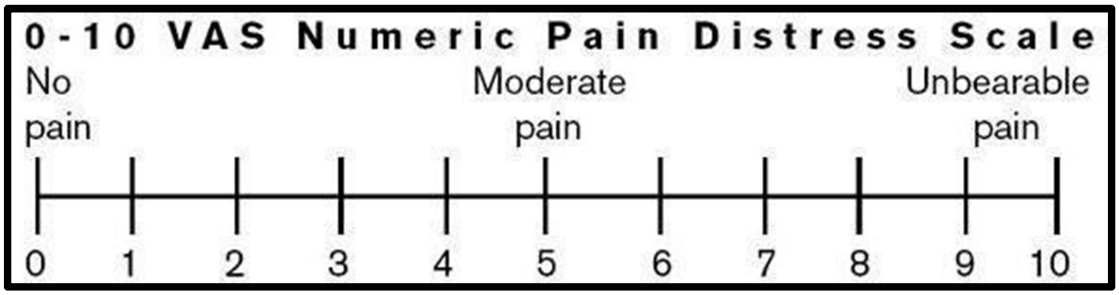
Distance between the MGJ to the gingival margin, measured with UNC 15 periodontal probe, taken at baseline and 3 months. [Red line-AB in diagram, Figure 1].

6. Thickness of keratinized tissue (TKT)[40]

Evaluated using an endodontic spreader, the process involved piercing the spreader through the soft tissue perpendicular to the mucosal surface with gentle pressure until encountering a firm surface. Subsequently, the silicone disk stop was firmly positioned against the soft tissue surface. Following the removal of the spreader, the depth of penetration was measured using a millimeter scale.

7. Pain Evaluation[41]

The patient's pain level was assessed using a scale from 0 to 10 (0 indicating no sensitivity and 10 indicating extreme pain) at two time points: one day after the operation and one week post-surgery.



8. Healing Index (HI)[42]

Given by Landry et.al (1988) will be used to evaluate the soft tissue healing immediately post -operatively 3rd and 1 week after surgery.

ARMAMENTARIUM

- A pair of sterile gloves
- Disposable mouth mask
- Head cap
- Sterilized mouth mirror
- Sterilized Straight Probe
- Sterilized UNC 15 probe (University of North Carolina 15)
- Sterilized Explorer
- Sterilized Tweezers
- Sterilized kidney tray
- Sterile Gauze and cotton pellets
- Disposable suction tips
- Normal saline
- Povidine-Iodine solution (5%w/v)
- Cold cure acrylic resin
- Ultrasonic Scaler (woodpecker Uds P -LED)
- Dental loupes 3.5X420mm (Blue Dental Co.)
- Disposable ophthalmic blade (Webel edge15º side port entry blade)
- Micro tissue holder (Blue dent Co.)
- Micro needle holder (Blue dent Co.)
- Straight and curved micro scissors (Blue dent Co.)
- Hu- friedy Gracey Curettes
- 6-0 vicryl resorbable surgical sutures
- 4-0 vicryl resorbable surgical sutures

- 5 ml disposable syringe for irrigation
- Sterilized Periosteal Elevator
- Bard parker handles (#3)
- B.P blade no 15
- Sterilized tissue forceps (non- toothed)
- A pair of sterilized straight and curved scissors
- Periodontal pack(COE-PAK)
- Digital Armamentarium: Digital Camera and Personal Computer

PLATELET RICH FIBRIN PREPARATION[43] EQUIPMENT

- Table centrifuge (Remi C-852)
- The blood collection kit comprises a 24-gauge butterfly needle and 10 ml plastic tubes coated with silica.

PROCEDURE

10 ml blood was retrieved from the patient's antecubital vein into a 10 ml tube devoid of anticoagulant. This tube was promptly subjected to centrifugation at a rate of 3000 rpm for 10 minutes which resulted in 3 layers: the top layer containing PPP, a layer which is in the middle is PRF clot, and RBCs at the bottom. The PRF clot was carefully separated, and the red blood clot was removed using sterilized scissors. The PRF gel was then placed in a PRF box, which was closed with the lid. After more than 10 seconds, the PRF underwent dehydration, transforming into a platelet-rich fibrin membrane. Gentle, slow and even pressure was applied to compress the fibrin clots into membranes, ensuring the final membrane remained consistently moist and soaked with serum. This delicate procedure prevented the loss of a significant amount of platelet growth factors incorporated into the membrane.

SURGICAL PROCEDURE[44]

Following LA, a trapezoidal flap was raised by making an incision placed sulcularly on the facial side of the tooth. This incision was performed horizontally into the neighboring interdental area, slightly coronally, either at or slightly above the CEJ of the tooth.

Vertical releasing incisions were then made mesially and distally along the line angles of the teeth, connecting the horizontal cuts. A full-thickness flap was carefully reflected using a periosteal elevator until reaching the mucogingival junction, followed by a partial-thickness flap positioned as close to the periosteum as possible through sharp dissection in the mesio-distal and apical directions, parallel to the mucosa, extending beyond the MGJ for tension-free coronal positioning.

The flap was split using either a microsurgical scalpel or a 15C surgical blade, removing epithelium from nearby papillae and the facial portion of attached gingival tissue to create a bleeding CT bed. The exposed root surface was gently smoothed to maintain tissue fibers, and the flap was repositioned.

A suspension suture was placed on both sides of the recession zone using a resorbable suture, left untied, and platelet-rich fibrin was applied to the root surface. Sutures were tied with the flap slightly above the CEJ, and interrupted sutures were placed along the releasing incision using appropriate absorbable sutures. Finally, the surgical site was covered with a periodontal pack.

Macrosurgery utilized corresponding instruments, while microsurgery employed microsurgical instruments and surgical loupes.

POST OPERATIVE CARE: All patients were advised to refrain from causing any injury and to stop brushing in the surgical area for a period of 15 days. Patients were directed to rinse their mouth with a 0.12% CHX for one minute, twice daily, for 15 days. Additionally, all patients were given antibiotics (Amoxicillin 500mg and clavulanic acid 125mg) to be taken twice daily for 5 days, along with analgesics (ketorolac 10mg) to be taken twice daily for 3 days.

Following post-op instructions will be given to the patients

1. Avoid spitting and rinsing for first 24hrs after the surgery.
2. Avoid touching the operated area with tongue/finger.
3. Consume a semi-solid or liquid diet for first 24 hrs after the surgery.
4. Apply ice intermittently on the face over the operated area on the day of the surgery.
5. Avoid too hot or spicy food.
6. In case of any excessive bleeding, report to the clinician as soon as possible.
7. Use 10ml of 0.2% chlorhexidine mouthwash twice a day for a week.

FIGURE 2: PRE - OPERATIVE ASSESSMENT

CONTROL GROUP: MACRO SURGICALLY TREATED CORONALLY POSITIONED FLAP WITH PRF MEMBRANE

PRE-OPERATIVE BASELINE EVALUATION

Measurement of PD with UNC – 15 probe and RCAL with UNC – 15 probe.

HGR using UNC- 15 probe and surgical stent.

Measurement of WKT

Measurement of TKT using UNC-15 periodontal probe

TEST GROUP: MICRO SURGICALLY TREATED CORONALLY POSITIONED FLAP WITH PRF MEMBRANE

PRE-OPERATIVE BASELINE EVALUATION

Measurement of PD and RCAL with UNC-15 probe and surgical stent.

Measurement of HGR with UNC- 15 probe and surgical stent.

Measurement of (WKT)

TKT using endodontic spreader with stopper

ARMAMENTARIUM FOR THE SURGICAL PROCEDURE

FIGURE 3: SURGICAL ARMAMENTARIUM

Macro-surgical Instruments

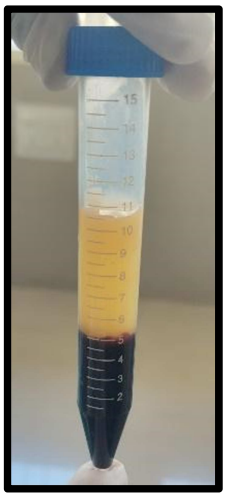
Micro-surgical Instruments

Centrifugation machine

FIGURE:4 PREPARATION OF PRF MEMBRANE

Collection of blood

Test tubes placed in Centrifuge



Layers of centrifuged blood

PRF Clot

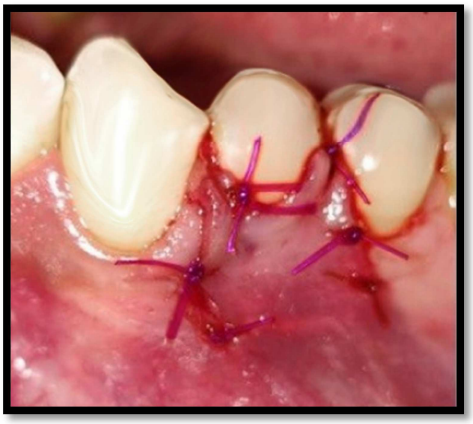
PRF Membrane

FIGURE 5: CONTROL GROUP: MACRO SURGICALLY TREATED CORONALLY POSITIONED FLAP WITH PRF MEMBRANE

Horizontal and vertical incisions of flap design given with 15 C blade

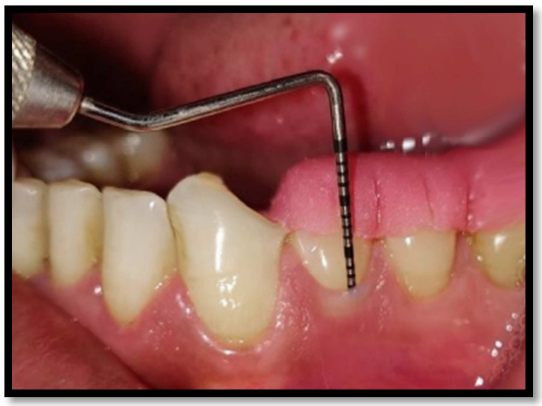
Platelet rich fibrin

Placement of PRF membrane



Approximation of flap and sutures are placed

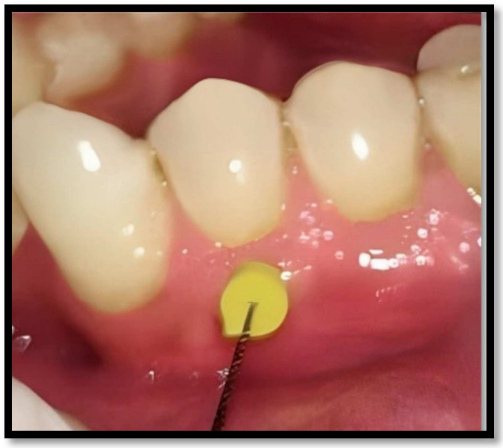
FIGURE 6: POST OPERATIVE - 3 MONTHS EVALUATION



Measurement of PD and RCAL with UNC- 15 probe and surgical stent.

Measurement Thickness of Keratinized tissue (TKT) using endodontic spreaders with stopper.

Measurement of Height of gingival recession (HGR)



Width of Keratinized Tissue (WKT) with UNC- 15 probe and surgical stent.

FIGURE 7: TEST GROUP: MICRO SURGICALLY TREATED CORONALLY POSITIONED FLAP WITH PRF MEMBRANE

Horizontal and vertical incisions of flap design given with microsurgical (ophthalmic disposable) blade.

PRF membrane

Placement of PRF membrane

Approximation of flap and sutures are placed

Periodontal pack placed

FIGURE 8: POST OPERATIVE - 3 MONTHS EVALUATION

Measurement of PD and Relative RCAL with UNC-15 probe and surgical stent.

Measurement of WKT

Measurement of Height of gingival recession (HGR)

Thickness of keratinized tissue (TKT) using endodontic spreaders with stopper

RESULTS AND OBSERVATIONS

The objective of the study was to assess the efficacy of macro-surgically and micro-surgically treated coronally advanced flaps with PRF for achieving RC in class I recession defects. Twenty-two sites affected by class I GR defects underwent treatment using either a macro-surgical or micro-surgical approach combined with PRF . The results were assessed at baseline, 1 month, 3 months following the surgery. Participants were randomly assigned to either Group A or Group B.

In Group A (Test group), 11 sites were treated with a micro-surgical approach for root coverage, while in Group B (Control group), 11 sites were treated with a macro-surgical approach. Various clinical parameters including "Gingival Index (GI), Height of gingival recession (HGR), Probing depth (PD), Relative clinical attachment level (RCAL), Width of keratinized tissue (WKT), Thickness of keratinized tissue (TKT), Visual Analog Scale (VAS), and Healing Index (HI)" were assessed to determine the success of RC in both treatment groups.

Statistical assessment was performed using SPSS version 21. The normality of the data was evaluated using the "Kolmogorov-Smirnov test". Descriptive statistics were used for scale data, while paired t-tests were employed to compare various durations within each group. "Independent T-tests and Mann-Whitney U tests" were conducted for intergroup comparisons.

Table:1 Correlation of Group A - B according to gender

Gender	Group - A	%	Group - B	%	Total	%
Male	4	36.36	6	54.55	10	45.45
Female	7	63.64	5	45.45	12	54.55
Total	11	100.00	11	100.00	22	100.00
Fisher exact test, p=0.6700						

Table:2 Correlation of Group A- B with mean age using t test

Groups	Mean	SD	SE	t-value	P-value
Group - A	32.27	6.75	2.04	0.1258	0.9011
Group - B	31.91	6.80	2.05		

Observations for Table 1 and Graph 1: There were no notable variation in the distribution of gender among the study groups (Table 1, Graph 1). Group A comprised 36.36% males and 63.64% females, while Group B consisted of 54.55% males and 45.45% females.

Observations for Table 2 and Graph 2: There were no notable variations in age between the study groups (Table 2, Graph 2). The mean age in Group A was (32.27±6.75), and in Group B, it was (31.91±6.80).

Table:3 Normality of different variables in Group A- B at different time intervals by "Kolmogorov Smirnov test"

Parameters	Times	Group - A		Group - B	
		Z-value	P-value	Z-value	P-value
GI	Baseline	0.4510	0.9870	0.3660	0.9990
	1 month	0.8060	0.5340	0.7240	0.6710
	3 months	0.4400	0.9900	1.1700	0.1140
HGR	Baseline	0.5350	0.9370	0.4970	0.9660
	1 month	0.4940	0.9680	0.3150	1.0000
	3 months	0.4830	0.9740	0.5110	0.9560
PD	Baseline	0.4340	0.9920	0.4600	0.9840
	1 month	0.8760	0.4260	0.5730	0.8970
	3 months	0.8440	0.4750	0.7140	0.6870
CAL	Baseline	0.4650	0.9820	0.4270	0.9930
	1 month	0.5890	0.8780	0.5860	0.8820
	3 months	0.4460	0.9890	0.5290	0.9420
WKT	Baseline	0.5090	0.9580	0.4770	0.9770
	1 month	0.5810	0.8880	0.4650	0.9820
	3 months	0.5160	0.9530	0.7170	0.6830
TKT	Baseline	0.5880	0.8800	0.4770	0.9770
	1 month	0.5730	0.8980	0.4650	0.9820
	3 months	1.2480	0.0890	0.7170	0.6830

The scores of different parameters in both groups followed a normal distribution at various treatment time points, allowing for the use of parametric tests. However, non-parametric tests were employed for pain and healing index scores **(Table 3)**.

Table:4a Correlation of Group A, Group B GI scores at variable time intervals - independent t test

Times	Group - A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	0.96	0.35	0.95	0.39	0.01	0.0405	0.9681
1 month	0.72	0.19	0.78	0.26	-0.06	-0.6230	0.5403
3 months	0.43	0.20	0.55	0.22	-0.11	-1.2654	0.2203
BL-1M	0.24	0.21	0.17	0.21	0.07	0.7360	0.4703
BL-3M	0.53	0.28	0.41	0.23	0.12	1.0735	0.2958
1M-3M	0.29	0.16	0.24	0.08	0.05	0.9485	0.3542

"*p < 0.0 5, M D - Mean difference, S D - Standard Deviation"

Table: 4b Correlation of different treatment time points with GI values in Group A- B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group - A	Baseline to 1 month	0.24	0.21	24.98	3.7227	0.0040*	0.7530
	Baseline to 3 months	0.53	0.28	54.87	6.1674	0.0001*	
	1 month to 3 months	0.29	0.16	29.90	6.0089	0.0001*	
Group - B	Baseline to 1 month	0.17	0.21	18.10	2.6658	0.0237*	0.7250
	Baseline to 3 months	0.41	0.23	42.86	5.8986	0.0002*	
	1 month to 3 months	0.24	0.08	24.76	9.6896	0.0001*	

"*p <0.0 5, M D- Mean difference, S D-Standard Deviation"

Observation for (Table 4a and 4b):

Upon comparing between the study groups, no notable differences were found in the MGI scores at any of the three time points examined (Table 4a, Graph 3a). At baseline, Group A displayed MGI of 0.96±0.35, while Group B had scores of 0.95±0.39. Subsequently, in Group A, the MGI scores were 0.72±0.19 and 0.43±0.20 at 1 month 3 months, whereas in Group B, the mean scores were 0.78±0.26 and 0.55±0.22 at the corresponding time points.

However, on intra-group comparison for both Group A,Group B, significant differences were observed at all assessment points. In Group A, the mean gingival score decreased from baseline to 1 month by 0.24±0.21 (p=0.0040), and from 1 month to 3 months by 0.29±0.16 (p=0.0001), indicating significant variations in mean gingival scores over time (Table 4b, Graph 3b). Similarly, in Group B, the MD in gingival score from baseline to 1 month was 0.17±0.21 (p=0.0237), and from 1 month to 3 months was 0.24±0.08 (p=0.0001), demonstrating significant differences in mean gingival scores over time (Table 4b, Graph 3b).

Consequently, at the conclusion of the 3rd-month follow-up, there was a notable disparity in gingival index scores within both study groups.

Table:5a Correlation of Group A, Group B HGR scores at variable time interval - Independent t test

Times	Group - A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	3.48	0.67	3.15	0.81	0.34	1.0622	0.3008
1 month	2.87	1.10	2.46	0.66	0.40	1.0401	0.3107
3 months	2.03	0.82	1.68	0.60	0.35	1.1366	0.2692
BL-1M	0.62	0.59	0.68	0.47	-0.06	-0.2827	0.7803
BL-3M	1.45	0.65	1.46	0.60	-0.01	-0.0376	0.9704
1M-3M	0.83	0.75	0.78	0.45	0.05	0.2070	0.8381

"*p <0.0 5, M D - Mean difference, S D - Standard Deviation"

Table:5b Correlation of different treatment time points with HGR in

Group A- B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group - A	Baseline to 1 month	0.62	0.59	17.75	3.4466	0.0063*	0.7230
	Baseline to 3 months	1.45	0.65	41.68	7.4123	0.0001*	
	1 month to 3 months	0.83	0.75	23.93	3.6783	0.0043*	
Group - B	Baseline to 1 month	0.68	0.47	21.70	4.8322	0.0007*	0.7200
	Baseline to 3 months	1.46	0.60	46.46	8.1067	0.0001*	
	1 month to 3 months	0.78	0.45	24.76	5.7911	0.0002*	

"*p <0.0 5, M D- Mean difference, S D-Standard Deviation"

Observation for Table 5a and 5b:

In the comparison between different groups, there were no notable variations observed in the average Height of Gingival Recession (HGR) scores across the groups at any of the three designated time periods (Table 5a and Graph 4a). At the commencement of the study, the mean HGR scores stood at 3.48±0.67 and 3.15±0.81 in Groups A, B, respectively. Over the course of the study, Group A exhibited mean HGR scores of 2.87±1.10 and 2.03±0.82 at 1 month , 3 months, respectively, while Group B showcased mean scores of 2.46±0.66 and 1.68±0.60 at 1 month,3 months.

Within each group, significant differences were observed at all measurement points. In Group A, the mean change in HGR score from baseline to 1 month was 0.62±0.59 (p=0.0063), and from 1 month to 3 months was 0.83±0.75 (p=0.0043). Similarly, in Group B, the mean change in HGR score from baseline to 1 month was 0.68±0.47 (p=0.0007), and from 1 month to 3 months was 0.78±0.45 (p=0.0002). These findings indicate significant alterations in mean HGR scores over time for both study groups (Table 5b and Graph 4b).

Consequently, by the conclusion of the 3rd-month evaluation period, there emerged a notable difference in HGR within both groups.

Table:6a Correlation of Group - A, Group - B PD at variable time intervals

- Independent t test

Times	Group – A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	2.07	0.68	2.02	0.49	0.05	0.1805	0.8586
1 month	1.38	0.68	1.49	0.57	-0.12	-0.4414	0.6637
3 months	0.94	0.64	0.92	0.62	0.02	0.0744	0.9414
BL-1M	0.69	0.27	0.53	0.36	0.16	1.2078	0.2412
BL-3M	1.12	0.65	1.10	0.52	0.03	0.1013	0.9203
1M-3M	0.43	0.52	0.57	0.36	-0.14	-0.7211	0.4792

"*p < 0.0 5, M D- Mean difference, S D-Standard Deviation"

Table:6b Correlation of variant treatment time points with PD scores in

Group A- B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group – A	Baseline to 1 month	0.69	0.27	33.32	8.5087	0.0001*	0.7350
	Baseline to 3 months	1.12	0.65	54.31	5.7385	0.0002*	
	1 month to 3 months	0.43	0.52	20.99	2.7765	0.0196*	
Group – B	Baseline to 1 month	0.53	0.36	26.01	4.8767	0.0006*	0.7890
	Baseline to 3 months	1.10	0.52	54.28	6.9476	0.0001*	
	1 month to 3 months	0.57	0.36	28.26	5.2462	0.0004*	

"*p < 0.0 5, M D - Mean difference, S D- Standard Deviation"

Observation for Table 6a and 6b:

In comparing different groups, no notable disparities were observed in the average Probing Depth (PD) scores between the 2 groups at any of the three follow - up periods (Table 6a and Graph 5a). Initially, the mean PD scores were 2.07±0.68 and 2.02±0.49 in Groups A,B, respectively. Over the course of the study, Group A demonstrated mean PD scores of 1.38±0.68 and 0.94±0.64 at 1 month,3 months. While Group B displayed mean scores of 1.49±0.57 and 0.92±0.62 at 1 month, 3 months.

Within each group, significant differences were noted at all measurement points. In Group A, the mean change in PD score from baseline to 1 month was 0.69 ±0.27 (p=0.0001), and from 1 month to 3 months was 0.43±0.52 (p=0.019). Similarly, in Group B, the mean change in PD score from baseline to 1 month was 0.53±0.36 (p=0.0006), and from 1 month to 3 months was 0.57±0.36 (p=0.0004). These findings indicate significant alterations in mean PD scores over time for both study groups (see Table 6b and Graph 5b).

Consequently, by the conclusion of the 3rd -month follow-up period, a statistically notable difference in PD was evident within both groups.

Table: 7a Correlation : Group A- B : CAL at variable variable time intervals - independent t test

Times	Group – A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	4.29	0.81	3.89	1.00	0.40	1.0375	0.3119
1 month	3.50	0.62	3.22	0.91	0.27	0.8163	0.4240
3 months	1.84	1.10	1.89	0.80	-0.05	-0.1221	0.9040
BL-1M	0.80	0.37	0.67	0.37	0.13	0.8285	0.4172
BL-3M	2.45	1.08	2.00	0.76	0.45	1.1411	0.2673
1M-3M	1.65	1.18	1.33	0.61	0.32	0.7994	0.4335

"*p<0.0 5, M D- Mean difference, S D-Standard Deviation"

Table:7b Correlation of variable treatment time points with CAL

Group A, Group B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group – A	Baseline to 1 month	0.80	0.37	18.59	7.1145	0.0001*	0.7950
	Baseline to 3 months	2.45	1.08	57.08	7.5431	0.0001*	
	1 month to 3 months	1.65	1.18	38.49	4.6266	0.0009*	
Group – B	Baseline to 1 month	0.67	0.37	17.13	5.9066	0.0001*	0.8020
	Baseline to 3 months	2.00	0.76	51.36	8.7760	0.0001*	
	1 month to 3 months	1.33	0.61	34.23	7.2708	0.0001*	

"*p < 0.05, M D- Mean difference, S D-Standard Deviation"

Observation for Table 7a and 7b:

Upon intergroup comparison, there were no significant variances observed in the average Relative Clinical Attachment Level (RCAL) scores between the groups at any of the three points considered in the study (Table 7a and Graph 6a). Initially, the mean RCAL scores stood at 4.29±0.81 and 3.89±1.00 in Groups A - B, respectively. Over the course of the study, Group A exhibited mean RCAL scores of 3.50±0.62 and 1.84±1.10 at 1 month, 3 months, respectively, while Group B showcased mean scores of 3.22±0.91 and 1.89±0.80 at 1 month , 3 months.

Intragroup comparison within both Group A, Group B revealed significant differences at all measurement points. In Group A, the mean change in RCAL score from baseline to 1 month was 0.80±0.37 (p=0.0001), and from 1 month to 3 months was 1.65±1.18 (p=0.0009). Similarly, in Group B, the mean change in RCAL score from baseline to 1 month was 0.67±0.37 (p=0.0001), and from 1 month to 3 months was 1.33±0.61 (p=0.0001). These findings illustrate significant alterations in MRCAL scores over time for both study groups (Table 7b and Graph 6b).

Consequently, by the conclusion of the 3-month follow-up period, there emerged a statistically improved difference in RCAL within both groups

Table:8a Correlation : Group A, Group B WKT scores at variable time intervals - independent t test

Times	Group - A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	3.54	0.55	3.63	0.67	-0.10	-0.3650	0.7189
1 month	4.50	0.67	3.86	0.71	0.63	2.1554	0.0435*
3 months	5.09	0.57	4.20	0.70	0.89	3.2652	0.0039*
BL-1M	0.96	0.59	0.23	0.18	0.73	3.9436	0.0008*
BL-3M	1.55	0.59	0.57	0.25	0.99	5.1139	0.0001*
1M-3M	0.59	0.35	0.34	0.16	0.26	2.2104	0.0389*

"*p <0.05, M D- Mean difference, S D-Standard Deviation"

Table:8b Correlation of variable treatment time points with WKT scores in Group A-B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group - A	Baseline to 1 month	0.96	0.59	27.11	-5.4326	0.0003*	0.8330
	Baseline to 3 months	1.55	0.59	43.92	-8.7275	0.0001*	
	1 month to 3 months	0.59	0.35	16.81	-5.6495	0.0002*	
Group - B	Baseline to 1 month	0.23	0.18	6.31	-4.1165	0.0021*	0.8160
	Baseline to 3 months	0.57	0.25	15.62	-7.6402	0.0001*	
	1 month to 3 months	0.34	0.16	9.31	-6.9378	0.0001*	

"*p< 0.0 5, M D- Mean difference, S D-Standard Deviation"

Observation for Table 8a and 8b:

On intergroup comparison, notable disparities were identified in the average WKT scores among the study groups across all three time points considered in the investigation (refer to Table 8a and Graph 7a). Initially, the mean WKT scores were 3.54±0.55 and 3.63±0.67 in Groups A - B. As the study progressed, Group A demonstrated mean WKT scores of 4.50±0.67 and 5.09±0.57 at 1 month, 3 months. while Group B exhibited mean scores of 3.86±0.71 and 4.20±0.70 at 1 month and 3 months.

Intragroup comparison within both Group A, Group B, significant differences were observed at all assessment points. In Group A, the mean difference in WKT score from baseline to 1 month was 0.96±0.59 (p=0.0003), and from 1 month to 3 months was 0.59±0.35 (p=0.0002). Similarly, in Group B, the mean difference in WKT score from baseline to 1 month was 0.23±0.18 (p=0.0021), and from 1 month to 3 months was 0.34±0.16 (p=0.0001). These findings underscore significant alterations in mean WKT scores over time for both study groups (Table 8b and Graph 7b).

Consequently, by the conclusion of the 3-month follow-up period, a statistically significant difference in WKT was evident within both groups

Table:9a Correlation : Group A , Group B with TKT at variable treatment time points - Independent t test

Times	Group - A		Group - B		Mean Diff.	t-value	p-value
	Mean	SD	Mean	SD			
Baseline	3.45	0.76	3.63	0.67	-0.18	-0.5897	0.5620
1 month	4.13	0.82	3.86	0.71	0.27	0.8327	0.4149
3 months	4.51	1.25	4.20	0.70	0.31	0.7224	0.4784
BL-1M	0.68	0.42	0.23	0.18	0.45	3.2435	0.0041*
BL-3M	1.06	1.15	0.57	0.25	0.49	1.3934	0.1788
1M-3M	0.38	0.89	0.34	0.16	0.04	0.1465	0.8850

"*p<0.0 5, M D- Mean difference, S D-Standard Deviation"

Table:9b Comparison of different treatment time points with TKT

Group A- B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	t-value	p-value	Effect size
Group - A	Baseline to 1 month	0.68	0.42	19.75	-5.3265	0.0003*	0.7480
	Baseline to 3 months	1.06	1.15	30.71	-3.0659	0.0119*	
	1 month to 3 months	0.38	0.89	10.96	-1.4078	0.1895	
Group - B	Baseline to 1 month	0.23	0.18	6.31	-4.1165	0.0021*	0.8160
	Baseline to 3 months	0.57	0.25	15.62	-7.6402	0.0001*	
	1 month to 3 months	0.34	0.16	9.31	-6.9378	0.0001*	

"*p<0.0 5, M D - Mean difference, S D - Standard Deviation"

Observation for Table 9a and 9b:

Upon comparison between groups, no notable improvement were observed in the average Thickness of Keratinized Tissue (TKT) scores at any of the three time points considered in the study (refer to Table 9a and Graph 8a). Initially, the mean TKT scores were 3.45±0.76 and 3.63±0.67 in Groups A, B respectively. Over the course of the study, Group A displayed mean TKT scores of 4.13±0.82 and 4.51±1.25 at 1 month, 3 months, respectively, while Group B exhibited mean scores of 3.86±0.71 and 4.20±0.70 at 1 month, 3 months.

Intragroup comparison within both Group A, Group B revealed significant differences at all measurement points. In Group A, the MD in TKT score from baseline to 1 month was 0.68±0.42 (p=0.0003), and from 1 month to 3 months was 0.38±0.89 (p=0.189). Similarly, in Group B, the MD in TKT score from baseline to 1 month was 0.23±0.18 (p=0.002), and from 1 month to 3 months was 0.34±0.16 (p=0.0001). These findings highlight significant alterations in mean TKT scores over time for both study groups (Table 9b and Graph 8b).

Therefore, by the conclusion of the 3-month follow-up period, a statistically significant difference in TKT was evident within both groups.

Table:10a Association of Group A, Group B with VAS at variable time intervals - Mann-Whitney U test

Times	Group - A			Group - B			U-value	Z-value	p-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
BL	6.00	0.89	11.18	6.09	0.70	11.82	57.00	-0.1970	0.8438
3rd day	3.91	0.70	7.73	5.09	0.83	15.27	19.00	-2.6923	0.0071*
7th day	1.73	0.47	7.95	2.82	0.98	15.05	21.50	-2.5281	0.0115*
BL-3rd day	2.09	0.54	14.59	1.00	1.18	8.41	26.50	2.1998	0.0278*
BL-7th day	4.27	0.90	14.14	3.27	1.35	8.86	31.50	1.8715	0.0613
3rd -7th day	2.18	0.75	11.23	2.27	1.01	11.77	57.50	-0.1642	0.8696

"*p<0.05, M D- Mean difference, S D-Standard Deviation"

Table:10b Comparison of different treatment time points with VAS

Group A- B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	Z-value	p-value	Effect size
Group - A	Baseline to 3rd day	2.09	0.54	34.85	2.9341	0.0033*	0.9470
	Baseline to 7th day	4.27	0.90	71.21	2.9343	0.0033*	
	3rd day to 7th day	2.18	0.75	36.36	2.9342	0.0033*	
Group - B	Baseline to 3rd day	1.00	1.18	16.42	2.1704	0.0300*	0.8140
	Baseline to 7th day	3.27	1.35	53.73	2.9342	0.0033*	
	3rd day to 7th day	2.27	1.01	37.31	2.9341	0.0033*	

"*p< 0.0 5, M D- Mean difference, S D- Standard Deviation"

Observation for Table 10a and 10b:

In the comparison between groups, significant disparities were observed in the mean Visual Analog Scale (VAS) scores at all three designated time points during the study (Table 10a and Graph 9a). Initially, the mean VAS scores were 6.00±0.89 and 6.09±0.70 in Groups A, B, respectively. As the study progressed, Group A exhibited mean VAS scores of 3.91±0.70 and 1.73±0.47 at 3rd day and 7th day, respectively, while Group B displayed mean scores of 5.09±0.83 and 2.82±0.98 at 3rd day and 7th day, respectively.

Upon intragroup comparison within Group A, Group B, significant differences were observed at all assessment points. In Group A, the mean difference in VAS score from baseline to 3rd day was 2.09±0.54 (p=0.0033), and from 3rd day to 7th day was 2.18±0.75 (p=0.0033). Similarly, in Group B, the mean difference in VAS score from baseline to 3rd day was 1.00±1.18 (p=0.0300), and from 3rd day to 7th day was 2.27±1.01 (p=0.0033). These findings indicate significant alterations in mean VAS scores over time for both study groups (Table 10b and Graph 9b).

Consequently, by the conclusion of the 7th day follow-up period, a statistically significant difference in VAS was evident within both groups

Table:11a Association of Group A- B with Healing index scores at variable time intervals by "Mann-Whitney U test"

Times	Group - A			Group - B			U-value	Z-value	p-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Baseline	1.73	0.65	12.27	1.55	0.52	10.73	52.00	0.5253	0.5994
3rd day	2.55	0.69	13.77	2.09	0.54	9.23	35.50	1.6088	0.1077
7th day	3.55	0.69	15.23	2.64	0.50	7.77	19.50	2.6594	0.0078*
BL- 3rd day	0.82	0.60	12.77	0.55	0.52	10.23	46.50	0.8865	0.3754
BL-7th day	1.82	0.60	15.05	1.09	0.30	7.95	21.50	2.5281	0.0115*
3rd -7th day	1.00	0.00	14.00	0.55	0.52	9.00	33.00	1.7730	0.0762

"*p< 0.0 5, M D- Mean difference, S D - Standard Deviation"

Table:11b Correlation of different treatment time points with Healing index scores in Group A - B : dependent t test

Groups	Changes from	Mean Diff.	SD Diff.	% of changes	Z-value	p-value	Effect size
Group - A	Baseline to 3rd day	0.82	0.60	47.37	2.5205	0.0117*	0.8830
	Baseline to 7th day	1.82	0.60	105.26	2.9343	0.0033*	
	3rd day to 7th day	1.00	0.00	57.89	2.9341	0.0033*	
Group - B	Baseline to 3rd day	0.55	0.52	35.29	2.2014	0.0277*	0.7550
	Baseline to 7th day	1.09	0.30	70.59	2.9341	0.0033*	
	3rd to 7th day	0.55	0.52	35.29	2.2014	0.0277*	

"*p<0.0 5, MD - Mean difference, S D-Standard Deviation"

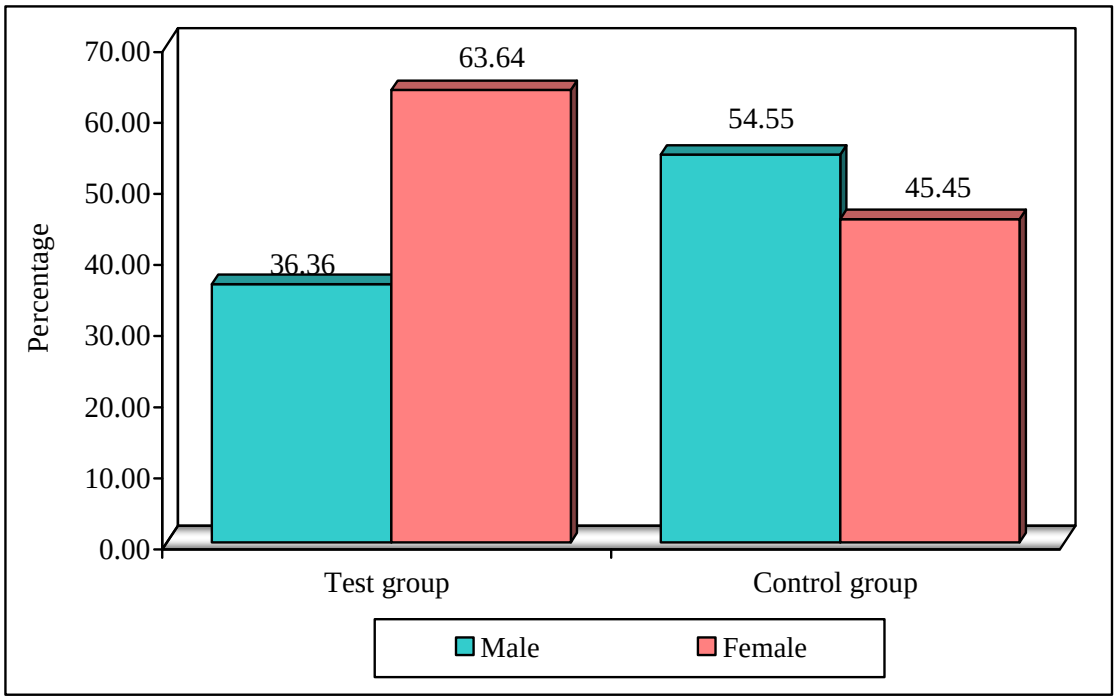
Observation for Table 11a and 11b:

In the comparison between groups, significant disparities were observed in the mean Healing Index (HI) scores at all three designated time points during the study (Table 11a and Graph 10a). Initially, the mean HI scores were 1.73±0.65 and 1.55±0.52 in Groups A - B, respectively. As the study progressed, Group A exhibited mean HI scores of 2.55±0.69 and 3.55±0.69 at 3rd day and 7th day, respectively, while Group B displayed mean scores of 2.09±0.54 and 2.64±0.50 at 3rd day and 7th day, respectively.

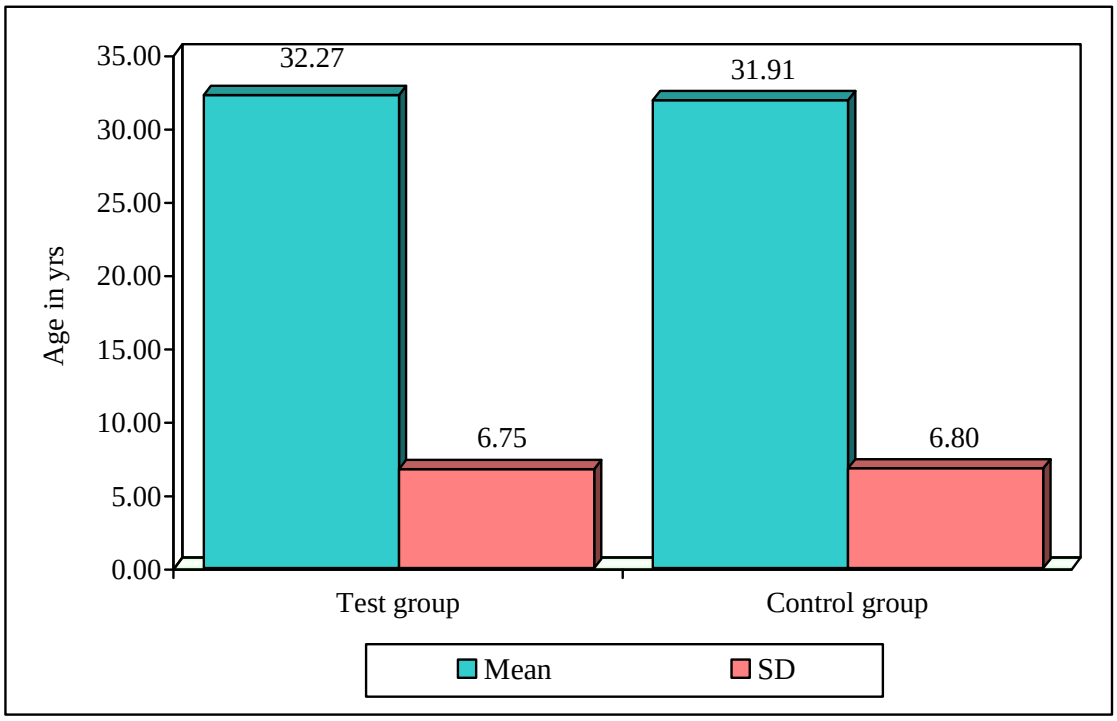
Upon intragroup comparison within Group A ,Group B, significant differences were observed at all assessment points. In Group A, the mean difference in HI score from before surgery to 3rd day was 0.82±0.60 (p=0.0117), and from 3rd day to 7th day was 1.00±0.00 (p=0.0033). Similarly, in Group B, the mean difference in HI score from before surgery to 3rd day was 0.55±0.52 (p=0.0277), and from 3rd day to 7th day was 0.55±0.52 (p=0.02). These findings indicate significant alterations in mean HI scores over time for both study groups (Table 11b and Graph 10b).

Consequently, by the conclusion of the 7th day follow-up period, a statistically significant difference in HI was evident within both groups.

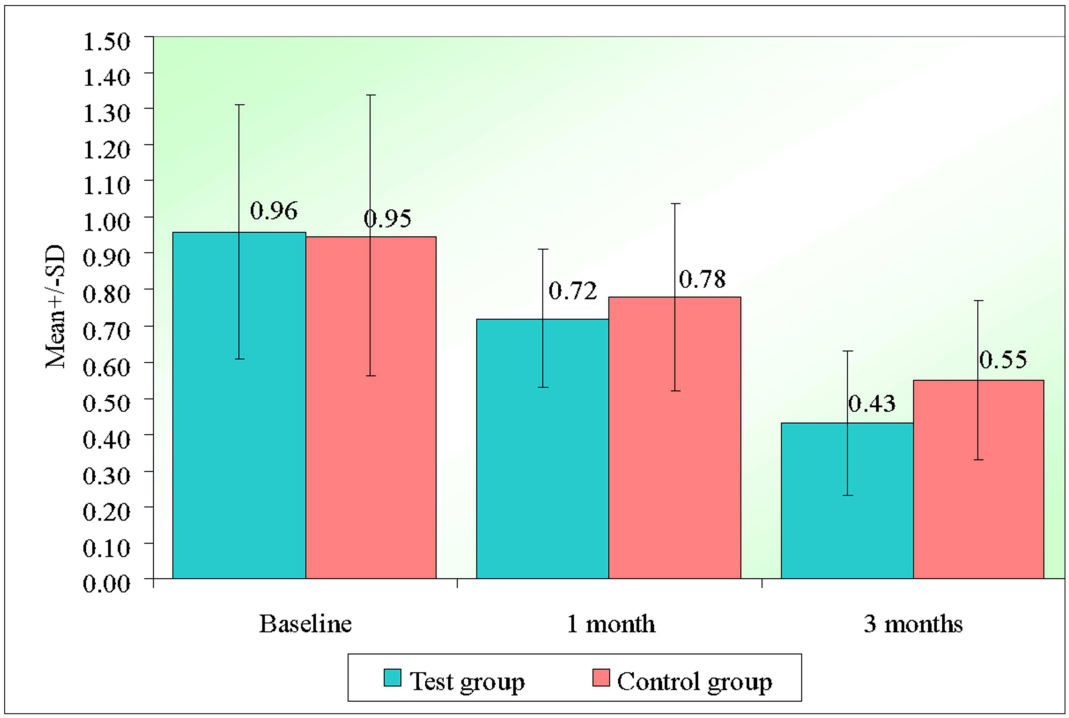
Graph 1: Association of Group - A, Group - B according to gender



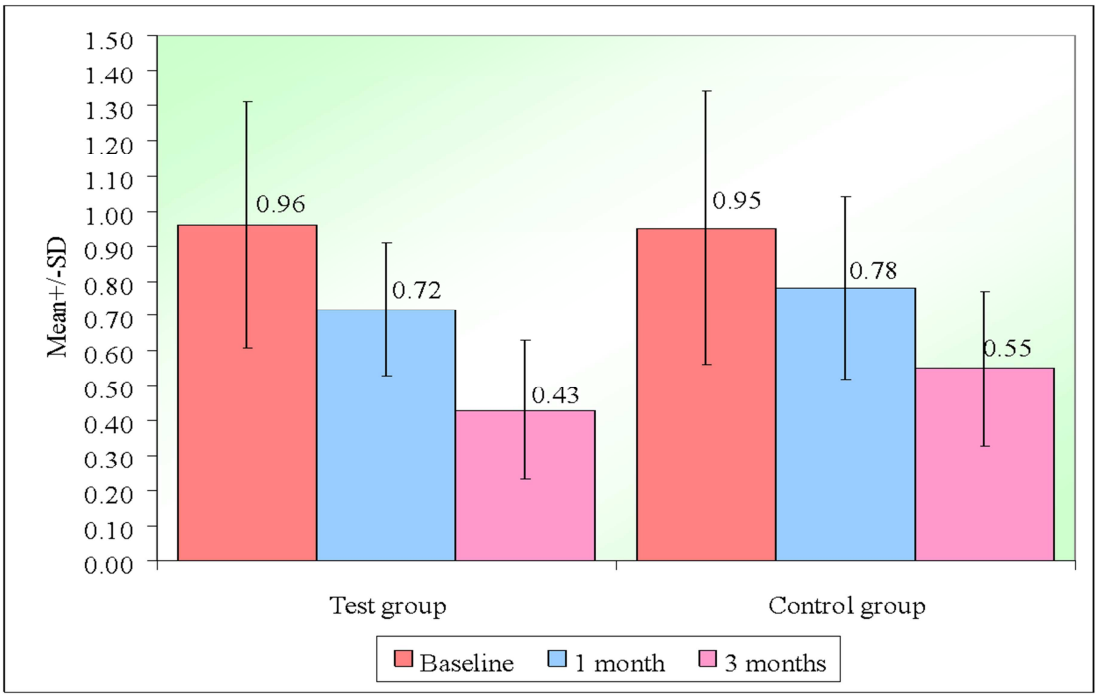
Graph 2: Association of Group A , Group B mean age by t test



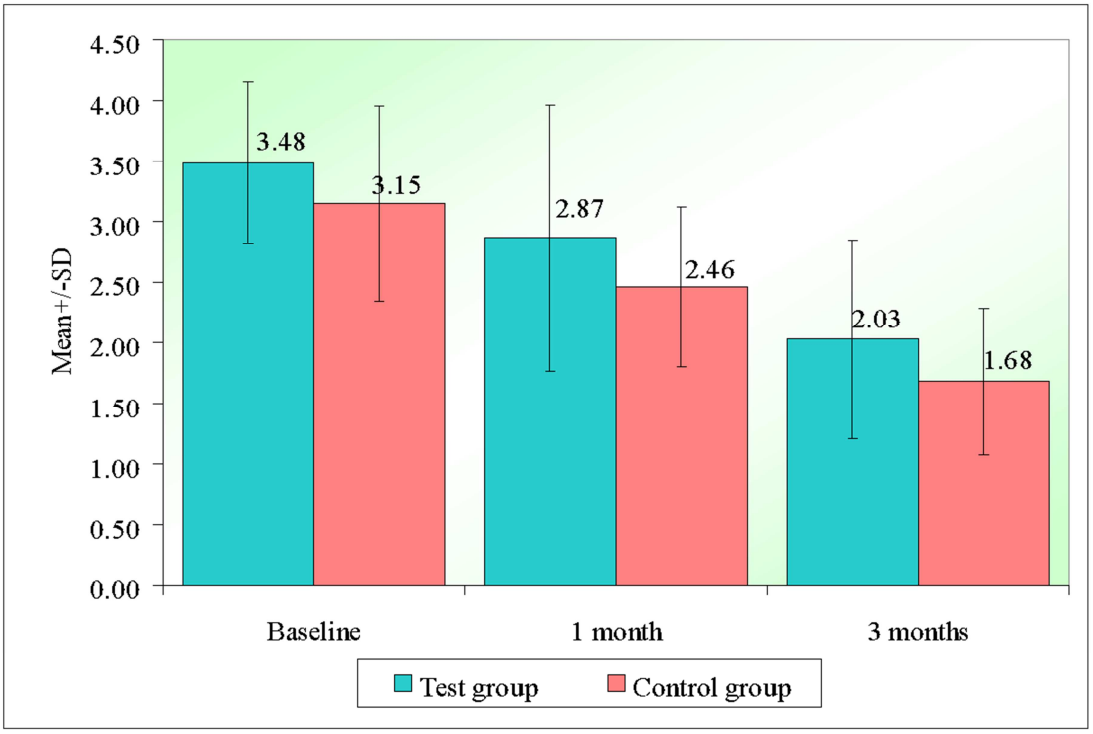
Graph 3a: Correlation of Group A Group B with GI scores at variable time intervals



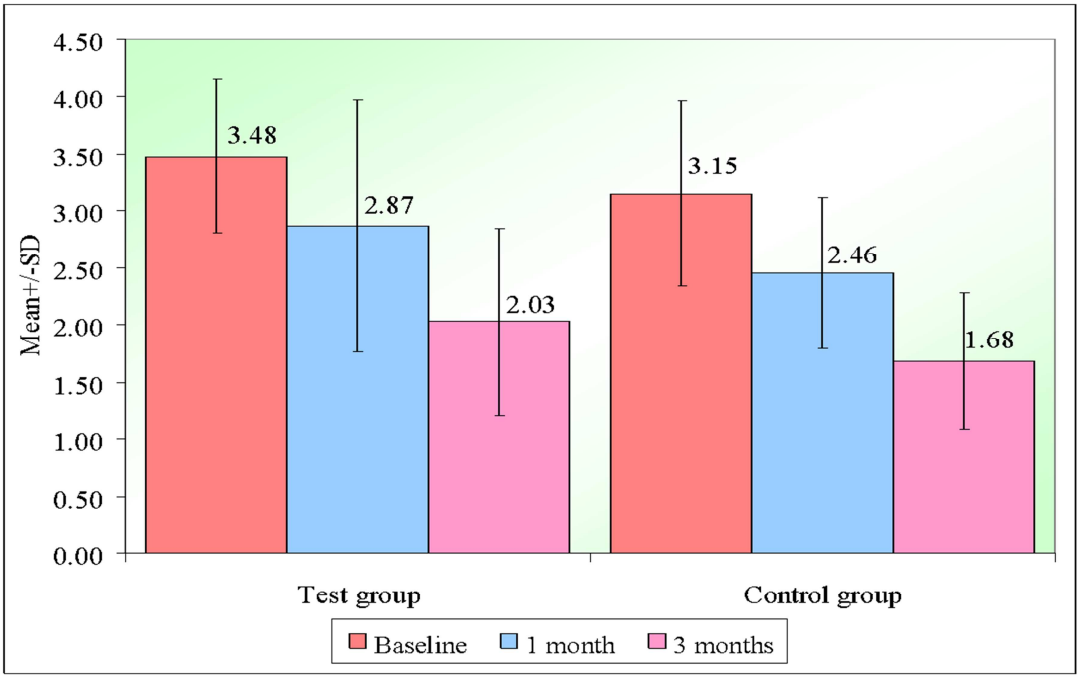
Graph 3b : Correlation of variable time interval with GI scores in Group A, Group B



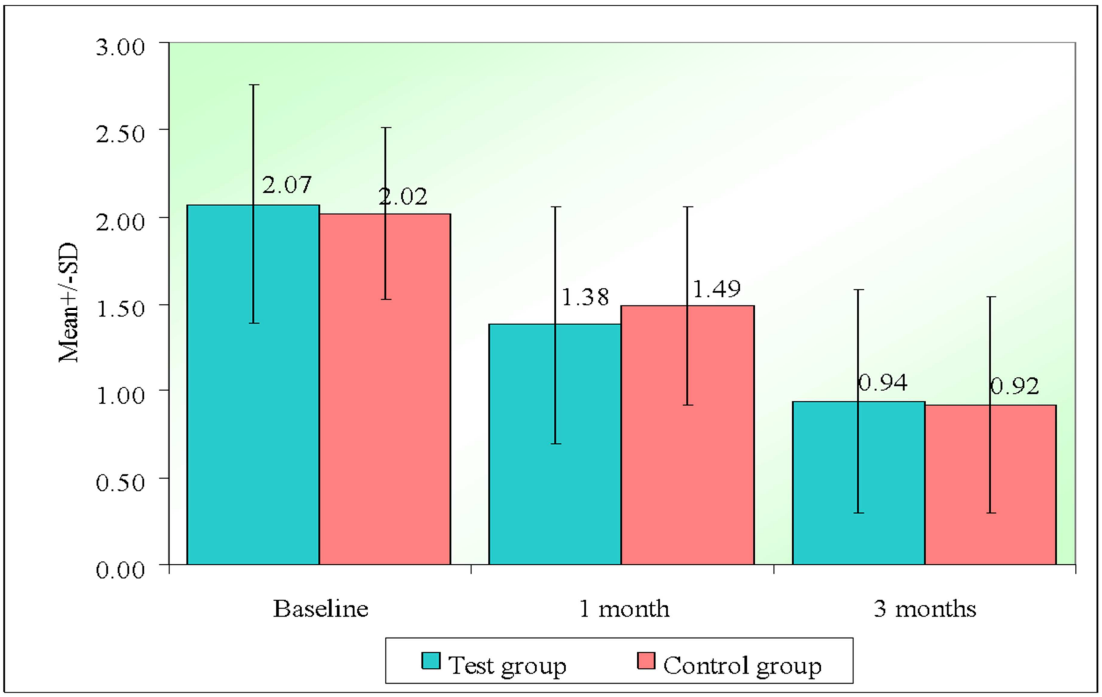
Graph 4a: Correlation of Group - A , Group - B HGR at variable time interval



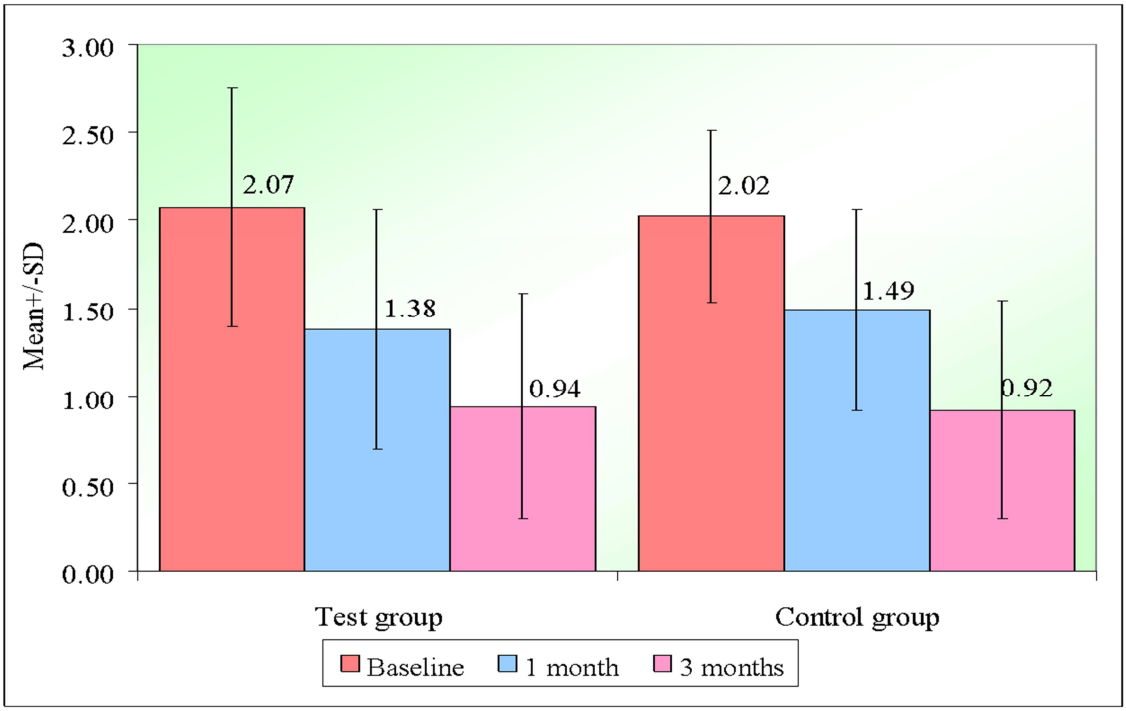
Graph 4b: Correlation of variable time intervals with HGR scores in Group A , Group B



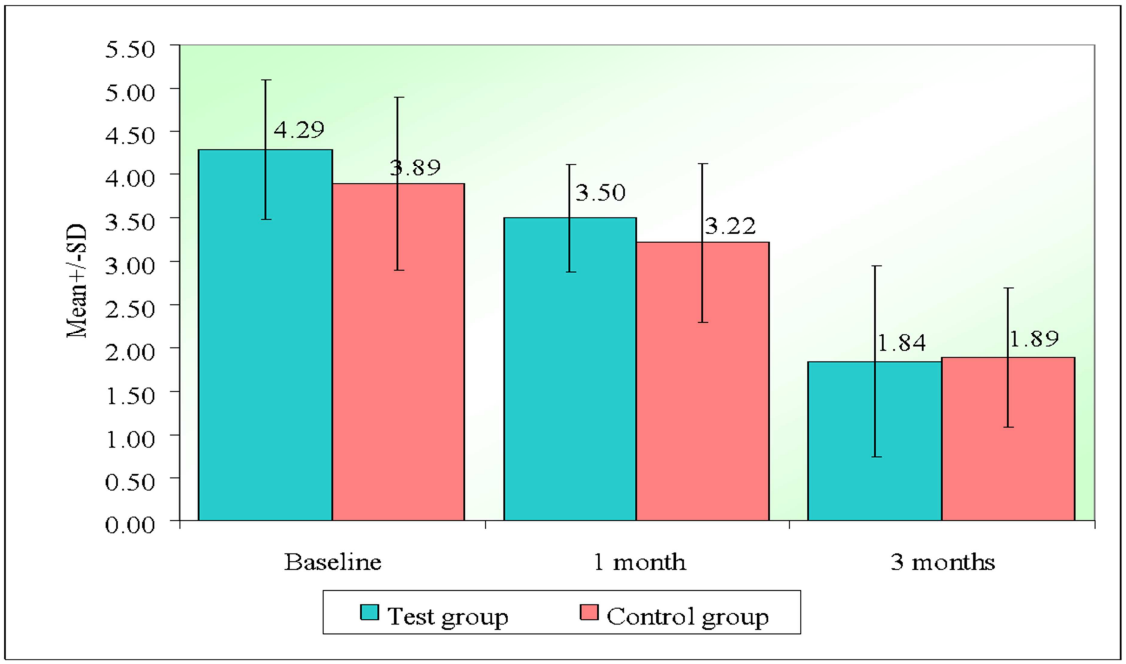
Graph 5a: Association of Group - A, Group - B : PD at variable treatment time points



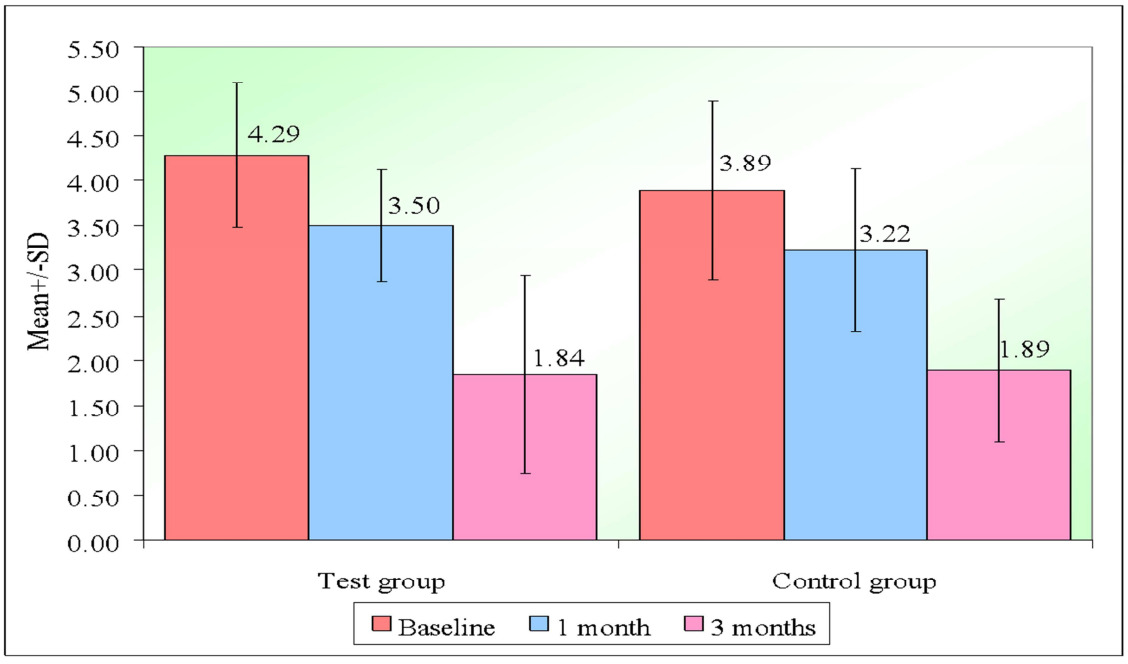
Graph 5b: Correlation of variable time interval with PD scores in Group A , Group B



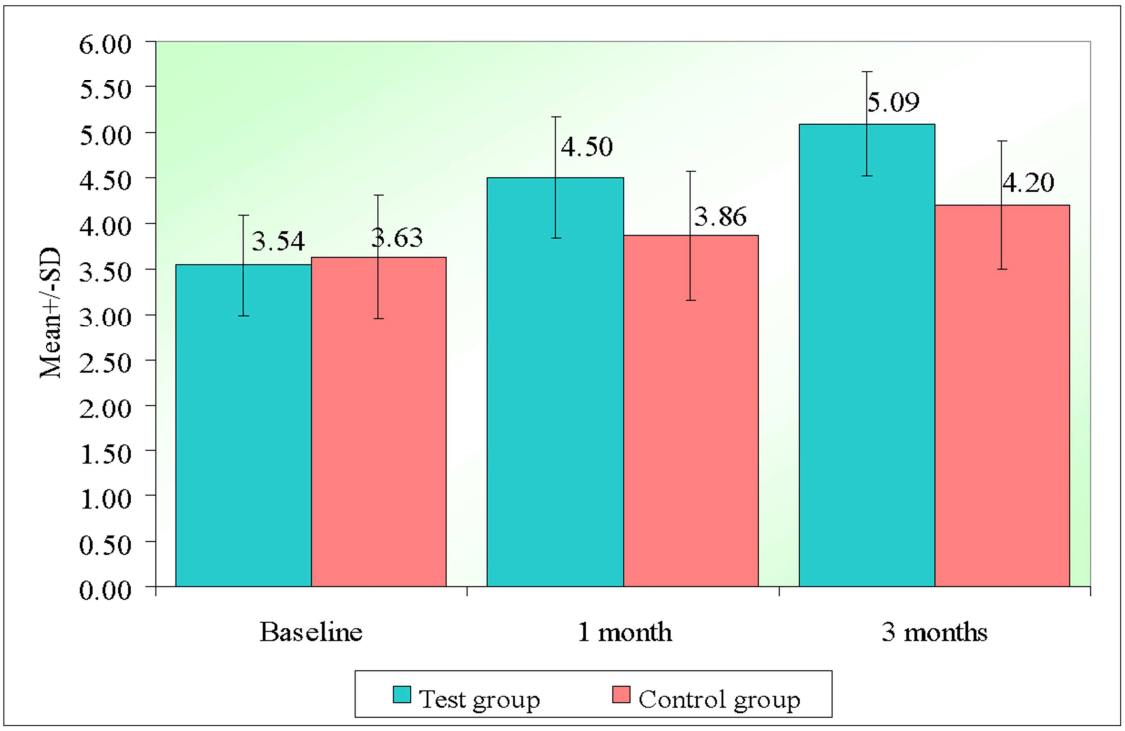
Graph 6a: Association of Group - A , Group - B CAL at variable treatment intervals



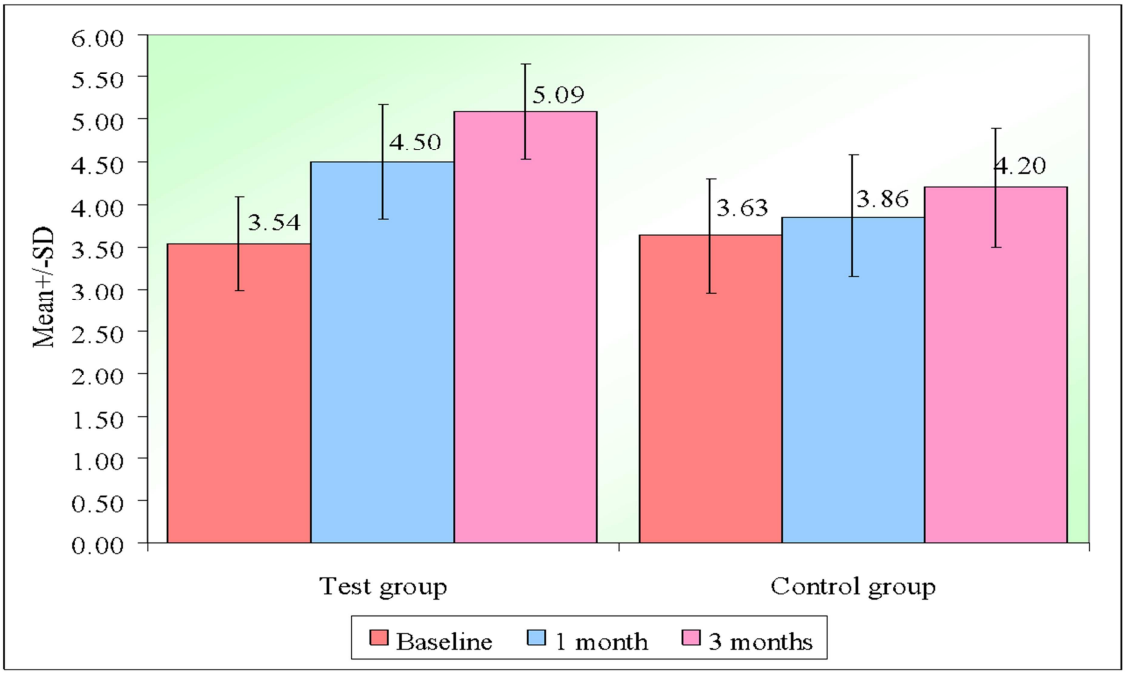
Graph 6b: Correlation of variable treatment time points with CAL in Group - A ,Group - B



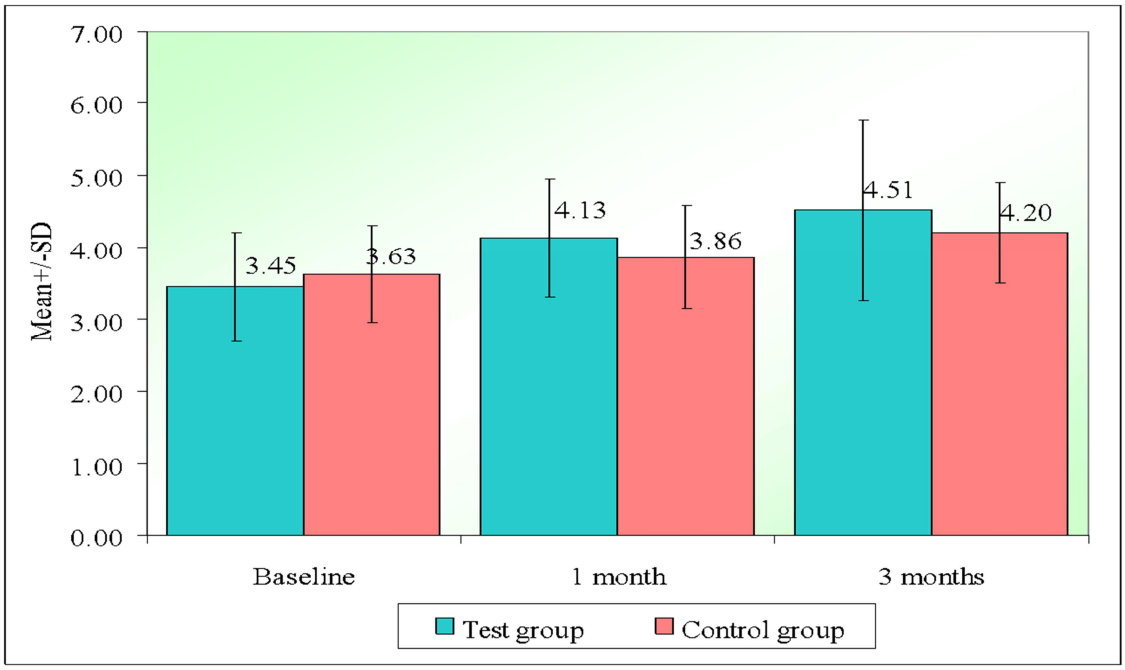
Graph 7a: Association of Group A , Group B ; WKT at variable treatment time interval



Graph 7b: Correlation of variable treatment time points with WKT scores in Group - A ,Group - B

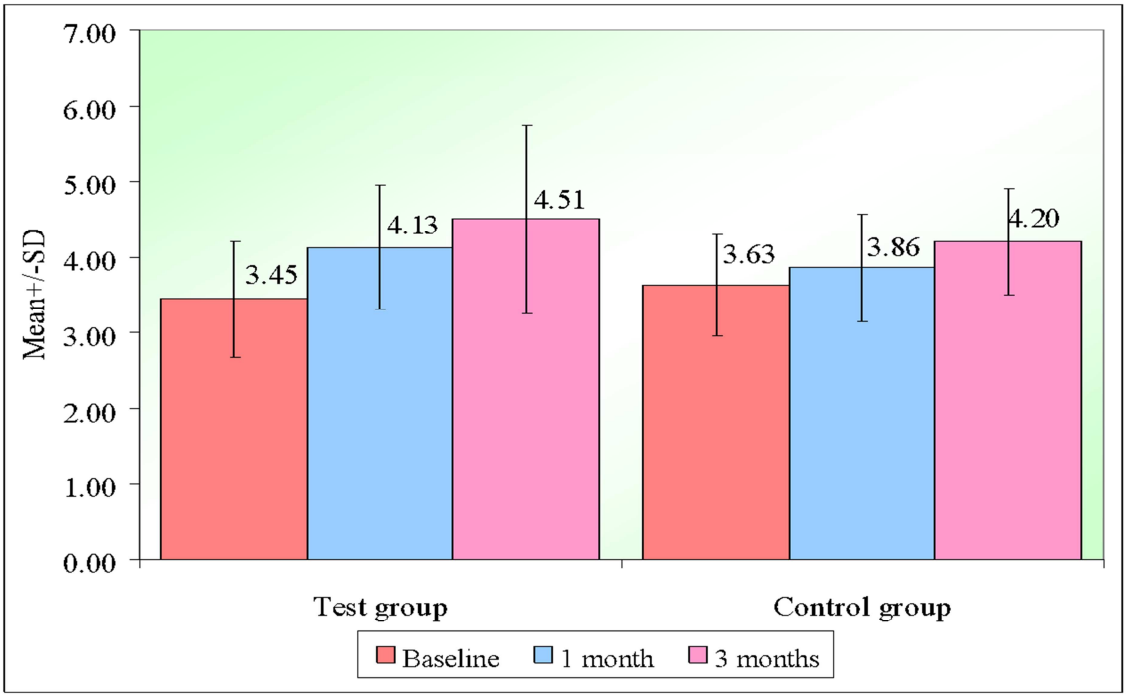


Graph 8a: Correlation of Group A , Group B - TKT at variable time interval

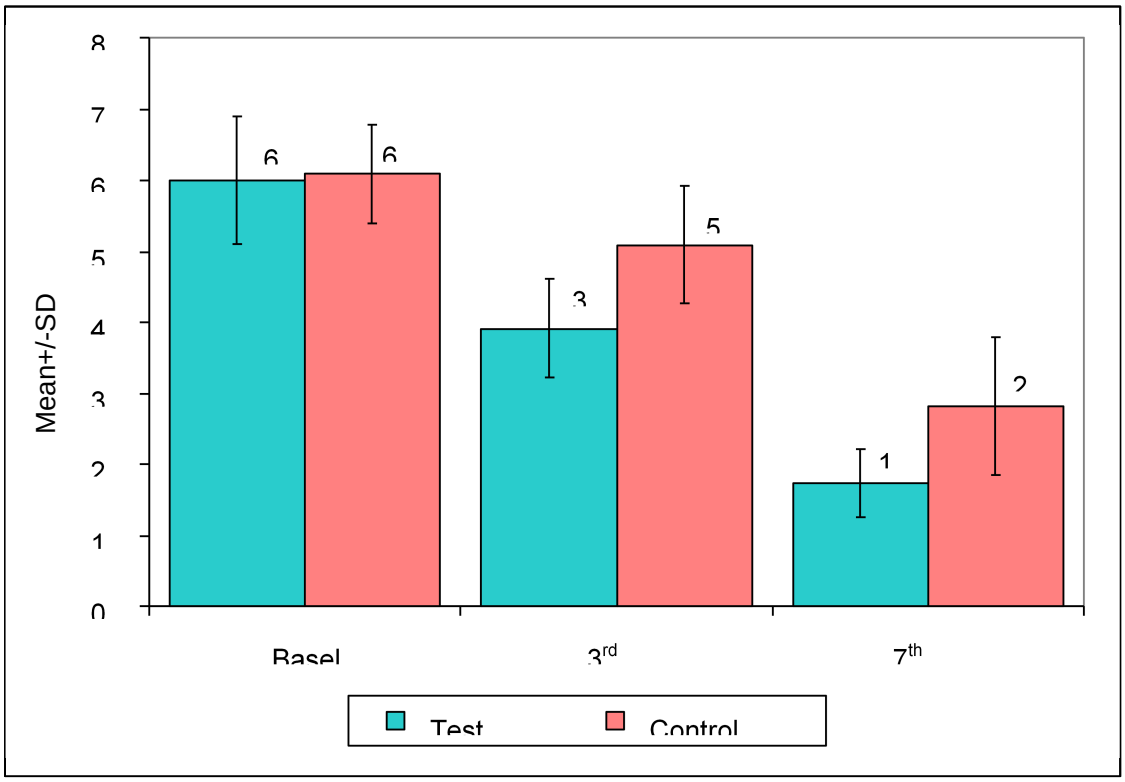


Graph 8b: Correlation of variable treatment time points with TKT scores

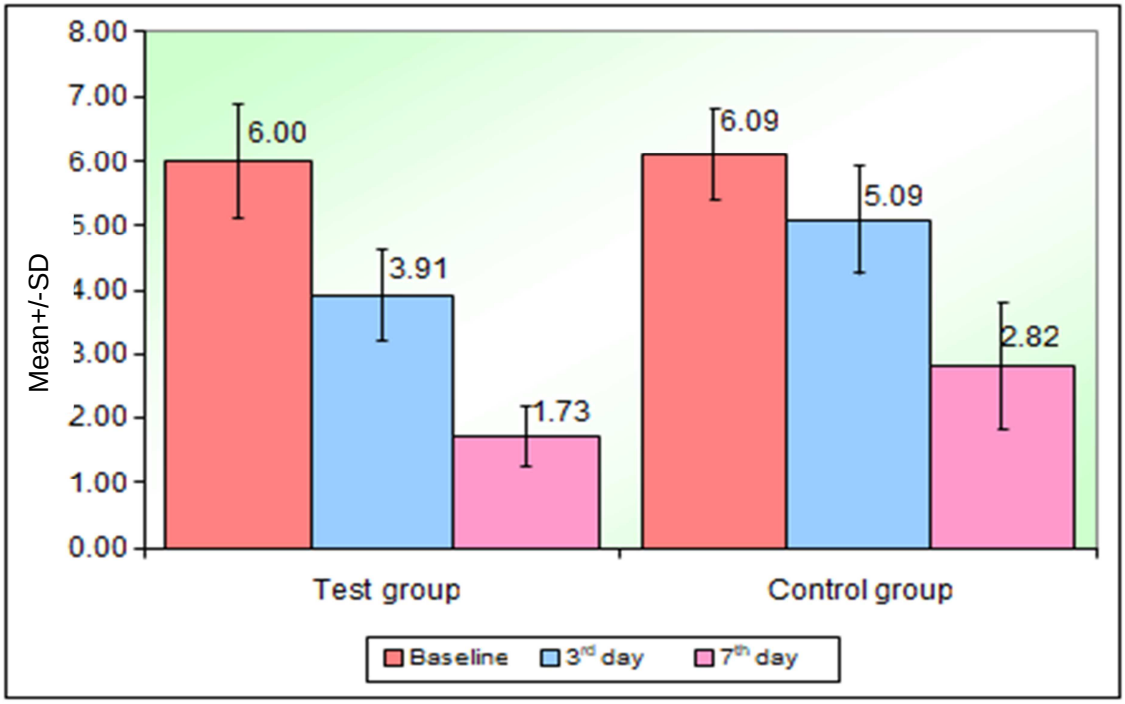
Group - A , Group - B



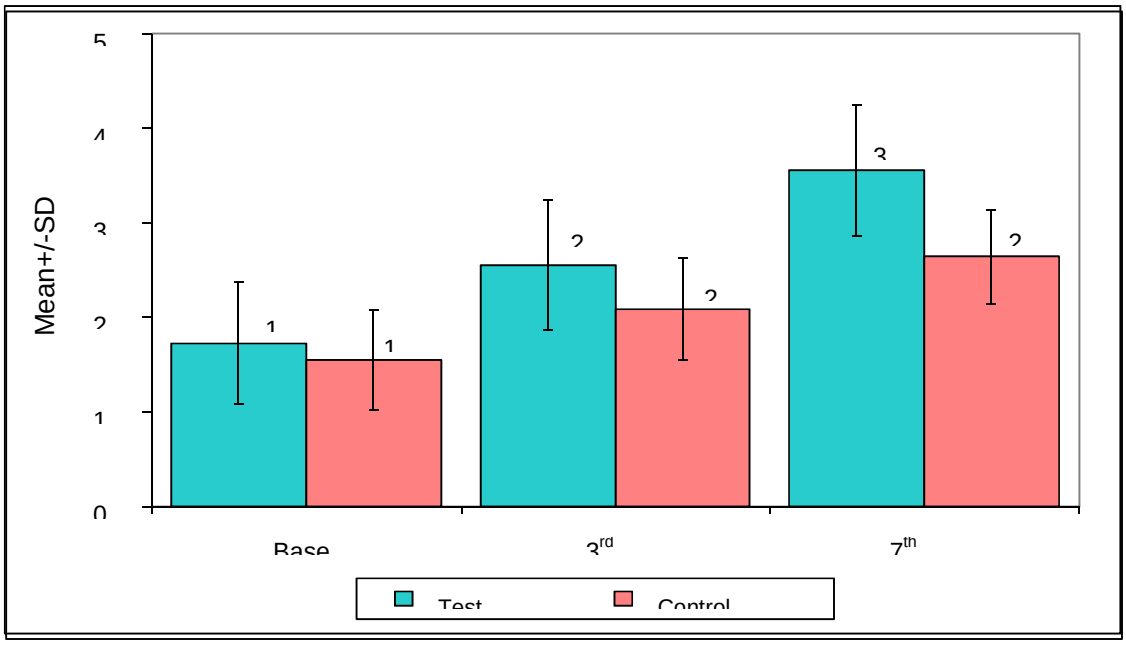
Graph 9a: Correlation of Group :A, Group :B with VAS at variable time points



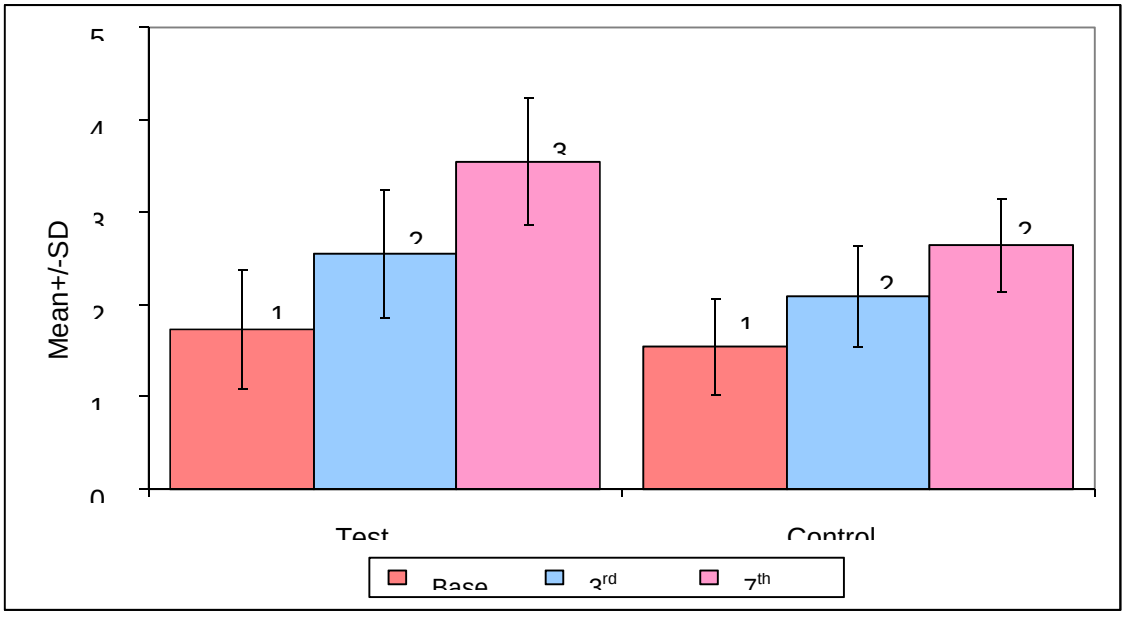
Graph 9b: correlation of variable treatment time intervals with VAS in Group - A , Group - B



Graph 10a: Comparing Group A , Group B based on their healing index at various stages of treatment.



Graph 10b: Correlation of the healing index scores at variable treatment time points between Group , Group B.



DISCUSSION

The main aim of periodontal therapy is to enhance the health of the gums and the tissues that support the teeth, ultimately ensuring the long-term functionality of the dentition.[45]

However, aesthetics are an integral component of contemporary oral treatment, and various methods have been suggested to uphold or improve patient aesthetics.The term 'periodontal plastic surgery' (PPS), first proposed by Miller (1988), was defined as 'surgical procedures performed to prevent or correct anatomical, developmental, traumatic or plaque induced defects of the gingiva, alveolar mucosa, or bone' "(The American Academy of Periodontology 1996)". One of the most frequent indications of PPS is the treatment of buccal GR.[46]

GR occurs when the gingival soft tissue margin shifts below the CEJ, resulting in the exposure of the root surface. This can be caused by either mechanical or physical factors affecting the gingival tissues or indirectly due to inflammation in the gingival tissues.[47] GR is a significant concern for many patients, particularly those with prominent smile lines, irregular GM , and noticeable root exposure, as they may feel self-conscious about GR and experience heightened sensitivity. This state can make plaque removal more challenging, potentially leading to root caries, loss of alveolar bone, and eventually, tooth loss.[48-50]

GR is a frequent clinical occurrence observed across various populations, irrespective of age, gender, or ethnicity. It has been calculated that over 60% of the global population experiences some degree of gingival recession.[51]

Given the widespread occurrence of this condition and its associated aesthetic and functional challenges, a comprehensive comprehension of the disease and its treatment options is critically important for effectively managing it and achieving predictable long-term results.[52]

The methods employed for RC rely on tissue shift through either translation ("pedicle flap procedures") or grafting ("free gingival or connective tissue graft procedures"), along with the application of resorbable and non-resorbable membranes based on GTR principles (Wennstrom, 1996). Various adaptations to traditional procedures have been introduced to achieve improved root coverage and enhanced aesthetics.[53-55]

Among various surgical techniques, the CAF procedure stands out as a widely used method for RC.[56,57] This approach involves shifting the soft tissues coronally over the visible root surface and is preferred for treating localized GR. It is relatively straightforward from a technical standpoint, well tolerated by patients due to its limited surgical area and absence of donor tissue harvesting, and delivers optimal aesthetic outcomes. The prerequisites for performing a CAF include having KT apical to the root exposure, with adequate height and thickness.[58-60]

First described by Norberg (1987)[61] and later detailed by Allen & Miller (1989)[62], the CAF technique involves utilizing similar-colored, textured, and thickened soft tissue to cover the exposed root, resulting in excellent aesthetic results.[63] The average RC achieved with a single-stage CAF ranges from 55% to 99%, while complete RC varies from 24% to 95%[64,65]of sites. Cairo et al (2008) concluded in a SR that the CAF procedure is a reliable and effective surgical method for treating localized GR.[66]

To enhance the predictability of establishing a new CTA over a visible root surface, the CAF may need to be combined with a barrier membrane following GTR principles. Studies by Pini Prato et al (1992)[56] suggested that the GTR procedure may yield more favorable RC results in sites with deep RD correlate to the CAF alone. Consequently, there's a growing interest in developing bioactive regenerative membranes to regulate inflammation and improve healing, representing a significant challenge in clinical research.[67,68] Innovations in advanced surgical dentistry, such as the use of PCs like PRP and PRF, have gained recognition for their advantages. PRF, in particular, has received unanimous approval from researchers due to its regenerative properties and benefits in tissue healing.[69]

PRF, initially utilized in 2001 by Choukroun et al,[70] is an autologous leukocyte-PRF [71,72] matrix.This structure is characterized by a tetra-molecular composition containing cytokines, PT, and SC.[73,74] It acts as a biodegradable scaffold[75] that fosters the development of microvasculature and directs the ECM.[76,77] Additionally, PRF may function as a carrier for cells involved in tissue regeneration[78] and exhibits sustained release of GFs[79] over a period of 1 to 4 weeks, facilitating significant wound healing.[80] Its intricate architecture comprises a robust fibrin matrix with favorable mechanical properties, undergoing gradual remodeling akin to a blood clot.[81]

The combination of PRF with CAF has demonstrated beneficial effects in treating GR[82]. Li R et al (2019)[7] reviewed the additional effects of various autologous platelet concentrates with CAF in treating gingival recessions, concluding that PRF could offer additional benefits compared to other platelet concentrates. With the development of new techniques and materials, there arises a need for innovative surgical approaches to reduce surgical injury and to overcome constraints related to surgeons' manual dexterity and vision. Incorporating a surgical microscope in PPS

enhance surgical precision. Consequently, microsurgical techniques were introduced to reduce tissue injury and facilitate wound healing with primary intention.[83]

Numerous studies have highlighted the benefits of utilizing an operating microscope, such as increased enhanced image and better light of the surgical field, along with microsurgical instruments. These tools enable more precise and gentle alteration of both mucosa and bone, improving access while minimizing unnecessary tissue removal. This optimization of defect debridement and root instrumentation enhances flap mobility and vascularization. Consequently, achieving better primary wound closure with reduced morbidity and discomfort, finer incision lines, and smaller surgical wounds contributes to improved aesthetic outcomes.[84,85]

The current study was undertaken to analyze the efficacy of macro-surgically and micro-surgically treated CAF with PRF for treating "Miller's class I gingival recession".

The study included 22 sites with Millers class I GR. Total sites of treatment were randomized into two groups using a computer generated randomization method. Test group comprised of 11 sites treated by micro surgically treated CAF with PRF and Control group comprised of 11 sites treated by macro surgically treated CAF with PRF. All the CP : GI, PI, HGR, PD, CAL, WKT and TKT were measured at baseline, 1 month, 3 months after the surgery and HI, VAS scores were evaluated at 3rd and 7th day post operatively.

In the present study demographic variables such as age and gender were compared in both test and control group. No notable variation in gender allocation among the study groups (Table 1, Graph 1). While 36.36% of Group A were males,

54.55% in Group B were males and while 63.64% of Group A were females, 45.45% in Group B were females.

There were no notable difference in age between the study groups, as indicated in Table 2 and Graph 2. The mean age for Group A was (32.27±6.75) and for Group B was (31.91±6.80).

Mean gingival index (mGI) was measured using Loe H Silness (1963)[35]. At baseline, the mGI scores were 0.96±0.35 and 0.95±0.39 in Groups A , B. In Group A, the mGI scores at 1 month and 3 months were 0.72±0.19 and 0.43±0.20.In Group B, the mean scores were 0.78±0.26 and 0.55±0.22 at 1 month and 3 months. (Table 4a & 4b, Graph 3a & 3b)

There were no significant variances found in the average scores for gingival index between the groups at any of the follow-up period, which implies that the participants maintained their oral health. Plaque and other irritants were removed during Phase-1 therapy, which reduced gingival inflammation and improved gingival status during the surgical intervention.

The mHGR scores at before the surgery were 3.48±0.67 and 3.15±0.81 in Groups A, B. Group A at 1 month and 3 months were 2.87±1.10 and 2.03±0.82, respectively. In Group B, the mean scores were 2.46±0.66 and 1.68±0.60 at 1 month and 3 months, respectively. There were no notable variations observed in the average Height of Gingival Recession (HGR) scores between the study groups at any of the three time points evaluated (Table 5a & 5b, Graph 4a & 4b).

This suggests that both treatment methods are successful in addressing gingival recessions.The reduction in the HGR can be attributed to the extent of the vertical releasing incision and the sharp dissection of the underlying fibers beyond the

mucogingival junction which helps in tension free CAF, thus creating a new GM at a more coronal level and facilitating coverage of the exposed root surface in CAF technique. These results are the same as those studies done by Andrade PF et al (2010)[44], Gupta S et al (2015)[39], Singh S K et al (2017)[23], Patel C et al (2019)[32].

Use of PRF has an advantage, that it contains high percentage of undamaged platelets within the fibrin matrix which in turn helped in better wound healing in the both the groups.This result is consistent with research done by Jankovic S et al (2012) and Padma R et al (2013). [86]

At baseline, the mean PD scores were 2.07±0.68 and 2.02±0.49 in Groups A, B, respectively. Group A, the mean PD scores at 1 month and 3 months' time points were 1.38±0.68 and 0.94±0.64, respectively. In Group B, the mean scores were 1.49±0.57 and 0.92±0.62 at 1 month and 3 months, respectively. On intra and inter group comparison of both test with control groups showed reduction in PD from base-line to 3 months, these outcomes were not notably improved. ($p>0.05$). (Table 6a & 6b, Graph 5a & 5b)

The reduction of PD in both the test and control was observed. The reason behind the reduction of probing depth is reinforcement of oral hygiene instructions given at initial periodontal therapy and during follow up periods. Furthermore, these outcomes may be linked to the graft's attachment to the RS, achieved through a blend of epithelial downgrowth and CTA.

These findings align with those documented in studies conducted by Francetti L et al (2005)[8], Aroca S et al (2009)[39], Andrade PF et al (2010)[44], Jankovic et al (2012)[30], Eren G, Atilla G (2014)[30], Nizam N et al (2015)[33], and Patel C et al (2019)[32].Contrary to present study, studies conducted by Cheung WS, Griffin TJ

(2004)[87], Bittencourt et al (2012)[88]observed significantly shallower PD. These findings might be attributed to differences in surgical instruments used, graft (SCTG) or regenerative materials (ACDM (or) EMD) which corroborated significant change of probing depth.

In this study, when comparing among the study groups, there were no significant variation observed in the mean RCAL scores at any of the three time points considered. At baseline, the mRCAL scores were 4.29±0.81 and 3.89±1.00 in Groups A, B. Group A, the mean RCAL scores at 1 month and 3 months were 3.50±0.62 and 1.84±1.10, respectively. Meanwhile, in Group B, the mean scores were 3.22±0.91 and 1.89±0.80 at 1 month and 3 months. (Table 7a & 7b, Graph 6a & 6b).

The reduction in PD combined with the regenerative properties of PRF, which aids in surgical wound healing, could explain its effectiveness in managing "GR" and improvement in CAL, is considered a successful treatment outcome, it does not necessarily indicate the quality of attachment formed. These findings are consistent with studies done by Pandey et al (2013)[89], Andrade PF et al (2010)[44], and Patel C et al (2019)[32].

In this study, within-group comparison of relative clinical attachment level (RCAL) values revealed a noticeable reduction in both the test, control groups at baseline, 3 months ($p<0.05$). These findings align with previous studies done by Padma R et al (2013)[86], Pandey et al (2013)[89], and Nizam N et al (2015)[33]. Both groups allow an improvement in relative CAL from baseline - 3 months.

An increase in the WKT , regardless of the specific measurement in millimeters, is seen as a successful outcome of augmentation procedures. In this study, when comparing within each group, the mWKT scores at baseline were 3.54±0.55 and

3.63±0.67 in Groups A,B. Group A, the mean WKT scores at 1 month, 3 months were 4.50±0.67 and 5.09±0.57, respectively. Meanwhile, in Group B, the mean scores were 3.86±0.71 and 4.20±0.70 at 1 month and 3 months. This difference showed a highly improved change between baseline , 3 months ($p<0.001$) (Table 8a & 8b and Graph 7a & 7b). These results are in line with studies done by Francetti L et al (2005)[8], Nizam N et al (2015)[33], and Gupta S et al (2015)[28].

In terms of between-group comparison, there was no noticeable difference at baseline ($p>0.05$), but at 3 months, a noticeable improvement was observed between the GroupA and GroupB($p<0.05$). At 3 months, correlated to the control group, the test group showed a greater gain of keratinized gingiva. This aligns with findings from studies by Andrade PF et al (2010)[44], Nizam N et al (2014)[32], Eren G, Atilia G (2014)[30], and Gupta S et al (2015)[28]. The increase in WKT following coronally positioned flap (CPF) procedures can be attributed to granulation tissue from the PDL and the tendency of the MGL to return to its original position. Additionally, the application of PRF may explain the proliferation of gingival or periodontal fibroblasts due to the GFs released from PT trapped in the fibrin clot.

The increase in WKT seen in the test group may be attributed to several benefits associated with the microsurgical approach, such as precise and soft handling of the soft tissues. This procedure could have promoted healing in these areas. Additionally, the easier and less tension-filled CAF over the defects with the microsurgical technique might facilitate to revert MGL to its normal position during the healing phase. The augmented WKT would improve plaque removal around the gingival margin and assist individuals in maintaining effective oral hygiene practices.[21].

In the current study, the comparison within each group regarding tissue thickness (TKT) revealed a notable improvement at baseline and 1 month ($p<0.05$). Specifically, at baseline, the mean TKT scores were 3.45±0.76 and 3.63±0.67 in Groups A ,B. Group A, the mean TKT scores at 1 month and 3 months were 4.13±0.82 and 4.51±1.25, respectively. Meanwhile, in Group B, the mean scores were 3.86±0.71 and 4.20±0.70 at 1 month ,3 months (Table 9a & 9b, Graph 8a & 8b).

There was no notable difference in intra-group comparison at baseline ($p>0.05$), but at 3 months, a notable improvement was observed ($p<0.05$). This finding is consistent with studies conducted by Aroca S et al (2009)[2] and Andrade PF et al (2010)[38], where the Group:A showed improvement in tissue dimensions compared to Group B at 3 - months.

It can be hypothesized that the observed enhancement in soft tissue thickness could be attributed to PRF, which is demonstrated to regulate cell augmentation in a manner specific to cell types. PRF has been shown to promote the proliferation of PDL cells ,GF , and osteoblasts while inhibiting epithelial cell growth. The structure of the fibrin meshwork, particularly when used alongside CAF, may contribute to the enhancement of GTT seen in PRF-treated areas, possibly due to a spacing effect created by the PRF membrane. Furthermore, micro-surgical technique with sharper and precise surgical blades, along with thinner suture material in minimal invasive procedures, likely resulted in reduced tissue injury. Additionally, the magnification provided by surgical loupes may aid in creating a flap with a consistent thickness and maintaining this thickness throughout the flap preparation process[21].

In the present study on inter and intra group comparison, VAS scores were highly statistically significant in Group:A correlated with Group:B, ($p<0.001$) at 1st & 7th day after surgery.

After one week post-surgery, both the test, control groups exhibited noticeable results, ($p<0.05$) (Table 10a & 10b , Graph 9a & 9b) with more reduction in VAS scores in Group:A when correlated to Group:B. Results were in favor of research conducted by Franchetti L et al (2005)[8], Nizam N et al (2015)[33], Singh S K et al (2017)[23], Patel C et al (2019)[32]. The lower pain levels observed in the Group-A in this study can be attributed to reduced tissue injury and improved wound healing by primary intention, as well as faster re-vascularization facilitated by the use of finer sutures and instruments during microsurgical interventions.

Wound Healing index given by Landry et.al (1988) was used to clinically evaluate early healing one week after a coronally advanced flap surgery. The one-week comparison of the study groups' wound healing index values, among the groups, there was a noticeable difference in the wound healing index scores with Group A, which was using microsurgery, showing superior results. The WHI calculates patient discomfort, flap dehiscence, gingival oedema, erythema, suppuration, and their presence or extent. The removal of micro-organisms, necrotic or injured tissue, and particle matter by the inflammatory process is thought to be essential for healing because it fosters a favorable environment for cellular metabolism. However, ineffective flap closure, severe tissue damage from surgical manipulation, and protracted suture retention in the tissues increase the inflammatory process and postpone the start of the healing phase.[88,89] (Table 11a & 11b, Graph 10a & 10b).

Based on the current data, it can be said that patients who underwent microsurgery experienced better outcomes in terms of favorable outcomes, reduced morbidity, and higher insipidity compared to those treated using macro-surgery. These findings are consistent with other clinical studies highlighting the advantages of microsurgery in periodontology. The enhanced magnification offered by microsurgery leads to increased revascularization shortly after the procedure, along with minimized vessel damage that promotes the formation of blood vessel connections within and around the surgical site. Additionally, the reduced trauma associated with microsurgery may accelerate capillary growth and ingrowth. These combined factors contribute to improved healing of soft tissues and better coverage of the root surface compared to conventional methods.

SUMMARY AND CONCLUSION

SUMMARY

GR is one of the most typical aesthetic concerns for patients. Additionally, patients are more susceptible and hence have a larger risk of getting root caries. Restoring the periodontium to health is the aim of mucogingival surgery. PPS aims to rejuvenate the periodontal tissues, ensuring they are healthy, functional, and visually pleasing, thereby concealing visible root surfaces.

The current research was undertaken to correlate the clinical ability of macrosurgically treated CAF technique with PRF membrane and microsurgically treated "CAF " combined with "PRF " for treating "Miller's class I gingival recession".

The study included 22 sites with Miller's class I GR. Total sites of treatment were randomized into two groups using computer generated randomization. Test group consists of 11 sites treated by microsurgically treated CAF with PRF and Control group consists of 11 sites treated by macrosurgically treated CAF with platelet rich fibrin. All the clinical parameters GI, HGR, PD, RCAL, WKT and TKT were assessed before performing surgery and at endpoint (3 months) succeding the surgery and VAS and HI were evaluated 3^{rd} and 7^{th} day post operatively.

CONCLUSION

In summary, the clinical effectiveness of incorporating an additional microsurgical technique for RC in “Miller Class I gingival recession”, utilizing a CAF and PRF, demonstrated notable improvement seen in WKT, TKT. Moreover, it resulted in reduced post-op pain and unease compared to a macrosurgical approach involving a CAF and PRF . These outcomes are credited to the advantageous application of surgical loupes, microsurgical instruments, and sutures, which facilitated improved flap adaptation and wound stabilization.

While the microsurgical method yielded better outcomes for RC compared to the traditional macrosurgical approach, the decision between micro and macro surgical techniques should be based on factors such as the surgeon's skill level, treatment goals, logistical considerations, cost, and patient-centered parameters.

Opting for microsurgery as the preferred treatment is recommended, as it enhances motor skills, improves surgical proficiency, enables wound healing by primary intention with precise alignment of the flap margin, and minimizes injury to the surgical area, resulting in superior clinical outcomes compared to traditional techniques.

LIMITATION

- The limited uptake of microsurgery in periodontal surgical practices, despite its numerous advantages, could be attributed to its inherent drawbacks. These drawbacks include limited visibility in certain areas, reduced depth perception and visual references, a steep learning curve, and the relatively higher initial expenses associated with setting up microsurgical equipment.
- The ability of the current investigation to confirm the stability and sustainability of the clinical outcome could be improved by a longer follow-up.
- Another significant disadvantage of the present investigation was the reduced sample size.
- Any bias or inaccuracy in the study could be the result of a single examiner's perception.
- In this analysis, only discrete recessions were taken into account.

Given the constraints of this current RCT study, the findings can be summarized as follows:

- The incorporation of PRF along with CAF can be a favorable option for addressing “Miller Class I gingival recession”. PRF, being patient's own material, has regenerative properties and promotes wound healing by gradually releasing growth factors.
- Employing CAF in addition with PRF membrane and microsurgery is a highly reliable technique for managing Miller Class I gingival recession. This approach offers the added benefit of improved root coverage, enhanced keratinized gingiva width, and increased tissue thickness.

- Microsurgery results in less postoperative discomfort and pain compared to macrosurgical approach combined with platelet-rich fibrin and coronally positioned flap.

FUTURE PERSPECTIVE

The future outlook for treating gingival recession is poised for advancements that prioritize minimally invasive techniques, enhanced tissue regeneration, and personalized treatment approaches. Innovations may include:

1. Continued research into regenerative materials such as growth factors, stem cells, and tissue engineering scaffolds to promote natural tissue regeneration and minimize postoperative complications.
2. Exploration of novel biological agents or biologically active molecules that stimulate gingival tissue growth, enhance wound healing, and improve outcomes without the need for extensive surgical intervention.
3. Utilization of genetic testing and biomarkers to tailor treatment strategies according to individual patient characteristics, ensuring optimized outcomes and reducing the risk of complications.
4. Integration of advanced imaging modalities such as 3D imaging, intraoral scanners, and artificial intelligence algorithms to enhance diagnosis, treatment planning, and monitoring of gingival recession cases.
5. Development of minimally invasive surgical techniques, such as microsurgery and laser-assisted procedures, to reduce patient discomfort, accelerate healing, and preserve healthy tissue.
6. Emphasis on patient education, shared decision-making, and psychological support to improve treatment adherence, satisfaction, and long-term oral health outcomes.

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ANNEXURE – 1

ETHICAL CLEARENCE

Research and Ethics Committee
KLE VK INSTITUTE OF DENTAL SCIENCES
A Constituent Unit of KLE Academy of Higher Education & Research
Accredited 'A' Grade by NAAC | Placed In Category 'A' by MHRD (GoI)
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CERTIFICATE

Sl. No. : 1574

EC/NEW/INST/2021/2435
Research & Ethics Committee

This is to Certify that the synopsis titled

Comparison between Microsurgical and Macrosurgical technique for the treatment of Gingival Recessions using Coronally advanced Flap and Platelet Rich Fibrin- A Randomized Controlled Clinical Trial-

Submitted by

Dr. _____ *P. G. Student /*

Staff, Guided by _____ *from Department of* _____ *has been critically evaluated by committee members and granted ethical clearance to conduct the above mentioned study*

Date : 23/3/24

Member Secretary
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi

MEMBER SECRETARY
Research & Ethical Committee
KLEVK Institute of Dental Sciences
BELGAVI.

Chairman
Research and Ethical Committee
KLEVK Institute of Dental Sciences

Chairman
Research and Ethical Committee
KLE VK Institute of Dental Sciences
Belgaum

ANNEXURE – 2

BIOSTATISTICS CLEARANCE CERTIFICATE

K L E VISHWANATH KATTI
INSTITUTE OF DENTAL SCIENCES
(A Constituent unit of KLE Academy of Higher Education & Research
(Formerly known as KLE University) Deemed-to-be-University u/s 3 of the UGC Act, 1956)
J.N.M.C. Campus, Nehru Nagar, Belagavi-590 010, Karnataka, India
Accredited 'A++' grade by NAAC (3rd Cycle) Placed in Category 'A' by MHRD (GoI)
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E-mail : principal@kledental-bgm.edu.in

Biostatistics Clearance Certificate

This is to certify that Biostatics aspect of the Dissertation of **Post Graduate Student,** under the guidance of **Reader, Department of Periodontics,** entitled **"Comparison between microsurgical and macrosurgical techniques for the treatment of gingival recessions using coronally advanced flap and platelet rich fibrin – A randomized controlled trial"** has been done under my guidance and completed satisfactorily.

Place: Belagavi
Date : 9/03/2024

Name & Signature of Biostatistician
Dr. S. B. JAVALI Ph.D.
Sr. Associate Professor in Statistics
Department of Community Medicine
USM KLE International Medical Programme
BELAGAVI-590010.

ANNEXURE – 3

PLAGIARISM CHECK REPORT

Scientific Correspondence and Review Committee

KLE VK Institute of Dental Sciences
A Constituent Unit of KLE Academy of Higher Education and Research
(Deemed-to-be-University u/s 3 of the UGC Act, 1956)
Nehru Nagar, Belagavi - 590 010, Karnataka State
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☎: 0831-2470362 Web: http://www.kledental-bgm.edu.in
FAX: 0831-2470640 E-mail:principal@kledental-bgm.edu.in

Date : 2.04.2024 Serial No. : 164

PLAGIARISM CHECK REPORT

Name of the Applicant :
UG / PG / Ph.D / Staff : POST GRADUATE
Batch & Year : 2021 - 2024
Department : PERIODONTICS

The soft copy of Research Work / Manuscript by ... entitled

"COMPARISON BETWEEN MICROSURGICAL AND MACROSURGICAL TECHNIQUES FOR THE TREATMENT OF GINGIVAL RECESSIONS USING CORONALLY ADVANCED FLAP AND PLATELET RICH FIBRIN- A RANDOMIZE CONTROLLED CLINICAL TRIAL"

under the guidance of .. ..has been submitted for Anti-Plagiarism check to the Scientific Correspondence & Review Committee of KLE VK Institute of Dental Sciences using "Turn-it-in" software.

The scan has been carried out and the scanned output reveals a Similarity Index of ....8.....%, which is **within / not within** the acceptable limits of 10% as per the UGC guidelines.

2/04/2024

Member Secretary
Scientific Correspondence and Review Committee
KLEVK Institute of Dental Sciences
KAHER-Belagavi

Chairman
Scientific Correspondence and Review Committee
KLEVK Institute of Dental Sciences
KAHER - Belagavi

ANNEXURE – 4

CONSENT FORM

DEPARTMENT OF PERIODONTICS

KAHER'S KLE V.K. INSTITUTE OF DENTAL SCIENCES

BELAGAVI

Comparison Between Microsurgical and Macrosurgical Techniques for the Treatment of Gingival Recessions using Coronally Advanced Flap and Platelet Rich Fibrin - A Randomized controlled clinical trial

Principal Investigator: DR.

I _____, aged _____ years have been informed about my involvement in the study.

I agree to give my personal details like Name, Age, Gender, Residential Address, past and Present dental history and any other details if required for the study to the best of my knowledge.

I will co-operate with the dentist.

I will follow the instructions given by the dentist during study.

I will visit the dentist as and when required for the study, at the given time and date.

I permit the dentist to utilize the information given and results obtained from this study for presentation and publication without disclosing my identity.

I have understood the nature of the study and permit the dentist to carry out the required surgical procedure and to draw blood for the same.

If for any reason I am unable to participate in the study, for reasons unknown, I can withdraw from the study at any given point of time.

I have been informed that the surgical procedure being performed on me for the purpose of root coverage .I permit the dentist to perform the same.

If by chance any complications arise during the above said procedure, I permit the dentist to take necessary actions to prevent the same.

In my full consciousness and presence of mind, after understanding all the procedures and related complications if any, in my vernacular language, I am willing and give my consent to participate in this study.

Date: Name of the witness/ Guardian:

Name of the patient: Signature:

Signature:

Address and phone No:

DEPARTMENT OF PERIODONTICS

KAHER'S KLE V.K. INSTITUTE OF DENTAL SCIENCES

BELAGAVI

Comparison Between Microsurgical and Macrosurgical Techniques for the Treatment of Gingival Recessions using Coronally Advanced Flap and Platelet Rich Fibrin - A Randomized controlled clinical trial

Principal Investigator: DR.

मी_____,वय _____ वर्ष ला माझ्या वरील संशोधनात सहभागी होण्याची कल्पना दिलेली आहे.

मी माझे वैयत्तिक माहिती, जसे नाव,वय,लिंग,घरचा पत्ता, पूर्व आणि सध्या चालू □ सलेल्या दांत इतिहास , आणि संशोधनासाठी आवश्यक □ सलेली सर्व माहिती देऊ इच्चीतो/ते.मी दंतचिकित्सकांना सहभाग देईन.

मी दंतचिकित्सकांनी दिलेल्या सर्व सूचना पेलिन.मी दंतचिकित्सकांनी संशोधनाकरिता जेव्हा बोलावलं तेव्हा दिलेल्या दिवशी आणि वेळेत येईन.मी दंतचिकित्सकांना मी दिलेली माहिती आणि संशोषणात मिळालेले परिणाम म्हजी ओळख उघड न करता प्रसारण करण्याची परवानगी देतो/ते .

मी संशोधनाचे □ भ्यास निसर्ग समजले आहे आणि त्यासाठी आवश्यक □ सलेली शल्यक्रिया □ मलात आणणे आणि त्यासाठी रक्त घेण्याची दंतचिकित्सकांना मी परवानगी आहे.कोणत्याही करणस्पती मी संशोधनात सहभागी होऊ शकले नाही ,□ ज्ञात कारणांमुळे, तर मी कोणत्याही वेळी संशोधन सोडू शकतो/ते. मला पूर्ण माहिती दिली आहे कि माझ्यावर केली जाणारी

शैल्यक्रिया आणि हि प्रक्रिया समझल्यानंतर मी दंतचिकित्सास माझ्यावर हि शैल्यक्रिया करण्यासाठी परवानगी देत आहे.

जर वरील शैल्यक्रिया करताना कोणत्याही गुंतागुंत उद्भवल्यास, मी त्याच टाळण्यासाठी आवश्यक क्रिया करण्याची दंतचिकित्सकास परवानगी देत आहे.

माझे पूर्ण देहभान आणि मन उपस्थितीत □ सताना , माझ्या मातृभाषेत सर्व प्रक्रीया आणि, जर □ सेल तर संबंधित गुंतागुंत समजून घेतल्यानंतर मी माझी या संशोधनात सहभागी होण्याची इचछा व्यक्त करतो/ते.

दिनांक :

रुग्णाचे नाव :

हस्ताक्षर :

पत्ता आणि फोने न :

साक्षीदार/पालकाचे नाव :

DEPARTMENT OF PERIODONTICS

KAHER'S KLE V.K. INSTITUTE OF DENTAL SCIENCES

BELAGAVI

Comparison Between Microsurgical and Macrosurgical Techniques for the Treatment of Gingival Recessions using Coronally Advanced Flap and Platelet Rich Fibrin -A Randomized controlled clinical trial

Principal Investigator: DR.

ನಾನು _____, _____ ವರ್ಷ ವಯಸ್ಸಿನ ನಾನು ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯ ಬಗ್ಗೆ ತಿಳಿಸಿದ್ದೇನೆ.

ನನ್ನ ವೈಯಕ್ತಿಕ ವಿವರಗಳಾದ ಹೆಸರು, ವಯಸ್ಸು, ಲಿಂಗ, ವಾಸಸ್ಥಳದ ವಿಳಾಸ, ಹಿಂದಿನ ಮತ್ತು ಪ್ರಸ್ತುತ ದಂತ ಇತಿಹಾಸ ಮತ್ತು ನನ್ನ ಜ್ಞಾನದ ಮಟ್ಟಿಗೆ ಅಧ್ಯಯನಕ್ಕೆ ಅಗತ್ಯವಿದ್ದರೆ ಇತರ ಯಾವುದೇ ವಿವರಗಳನ್ನು ನೀಡಲು ನಾನು ಒಪ್ಪುತ್ತೇನೆ.

ನಾನು ದಂತವೈದ್ಯರೊಂದಿಗೆ ಸಹಕರಿಸುತ್ತೇನೆ.

ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ದಂತವೈದ್ಯರು ನೀಡಿದ ಸೂಚನೆಗಳನ್ನು ನಾನು ಅನುಸರಿಸುತ್ತೇನೆ.

ನಾನು ದಂತವೈದ್ಯರನ್ನು ಅಧ್ಯಯನಕ್ಕೆ ಅಗತ್ಯವಿರುವಾಗ, ನಿರ್ದಿಷ್ಟ ಸಮಯ ಮತ್ತು ದಿನಾಂಕದಂದು ಭೇಟಿ ಮಾಡುತ್ತೇನೆ.

ನನ್ನ ಗುರುತನ್ನು ಬಹಿರಂಗಪಡಿಸದೆ ಪ್ರಸ್ತುತಿ ಮತ್ತು ಪ್ರಕಟಣೆಗಾಗಿ ನೀಡಲಾದ ಮಾಹಿತಿ ಮತ್ತು ಈ ಅಧ್ಯಯನದಿಂದ ಪಡೆದ ಫಲಿತಾಂಶಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳಲು ನಾನು ದಂತವೈದ್ಯರಿಗೆ ಅನುಮತಿ ನೀಡುತ್ತೇನೆ.

ನಾನು ಅಧ್ಯಯನದ ಸ್ವರೂಪವನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ ಮತ್ತು ದಂತವೈದ್ಯರಿಗೆ ಅಗತ್ಯವಾದ ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ವಿಧಾನವನ್ನು ಕೈಗೊಳ್ಳಲು ಮತ್ತು ಅದಕ್ಕಾಗಿ ರಕ್ತವನ್ನು ಸೆಳೆಯಲು ಅನುಮತಿ ನೀಡಿದ್ದೇನೆ.

ಯಾವುದೇ ಕಾರಣಕ್ಕಾಗಿ ನಾನು ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಸಾಧ್ಯವಾಗದಿದ್ದರೆ, ಅಜ್ಞಾತ ಕಾರಣಗಳಿಗಾಗಿ, ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು.

ರೂಟ್ ಕವರೇಜ್ ಉದ್ದೇಶಕ್ಕಾಗಿ ನನ್ನ ಮೇಲೆ ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ವಿಧಾನವನ್ನು ನಡೆಸಲಾಗುತ್ತಿದೆ ಎಂದು ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ. ನಾನು ದಂತವೈದ್ಯರಿಗೆ ಅದನ್ನೇ ಮಾಡಲು ಅನುಮತಿ ನೀಡುತ್ತೇನೆ.

ಮೇಲಿನ ಕಾರ್ಯವಿಧಾನದ ಸಮಯದಲ್ಲಿ ಆಕಸ್ಮಿಕವಾಗಿ ಯಾವುದೇ ತೊಡಕುಗಳು ಉಂಟಾದರೆ, ಅದನ್ನು ತಡೆಗಟ್ಟಲು ಅಗತ್ಯವಾದ ಕ್ರಮಗಳನ್ನು ತೆಗೆದುಕೊಳ್ಳಲು ನಾನು ದಂತವೈದ್ಯರಿಗೆ ಅನುಮತಿ ನೀಡುತ್ತೇನೆ.

ನನ್ನ ಪೂರ್ಣ ಪ್ರಜ್ಞೆ ಮತ್ತು ಮನಸ್ಸಿನ ಉಪಸ್ಥಿತಿಯಲ್ಲಿ, ಎಲ್ಲಾ ಕಾರ್ಯವಿಧಾನಗಳು ಮತ್ತು ಸಂಬಂಧಿತ ತೊಡಕುಗಳು ಯಾವುದಾದರೂ ಇದ್ದರೆ, ನನ್ನ ಸ್ಥಳೀಯ ಭಾಷೆಯಲ್ಲಿ ಅರ್ಥಮಾಡಿಕೊಂಡ ನಂತರ, ನಾನು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಸಿದ್ಧನಿದ್ದೇನೆ ಮತ್ತು ನನ್ನ ಒಪ್ಪಿಗೆಯನ್ನು ನೀಡುತ್ತೇನೆ.

ದಿನಾಂಕ:

ಸಾಕ್ಷಿ/ಪಾಲಕರ ಹೆಸರು:

ರೋಗಿಯ ಹೆಸರು:

ಸಹಿ:

ವಿಳಾಸ ಮತ್ತು ದೂರವಾಣಿ ಸಂಖ್ಯೆ:

ANNEXURE – 5

PROFORMA

DEPARTMENT OF PERIODONTIC□,

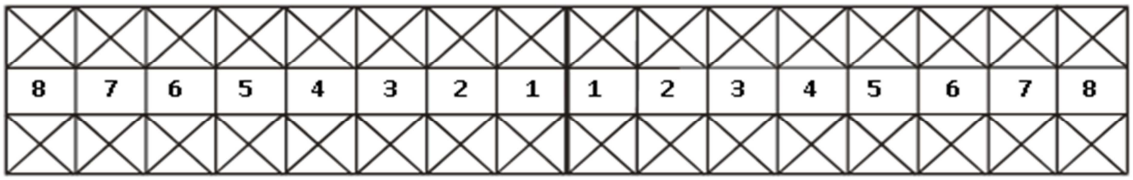
KAHER'□KLE's V.K. IN□TITUTE OF DENTAL □CIENCE□,

BELAGAVI

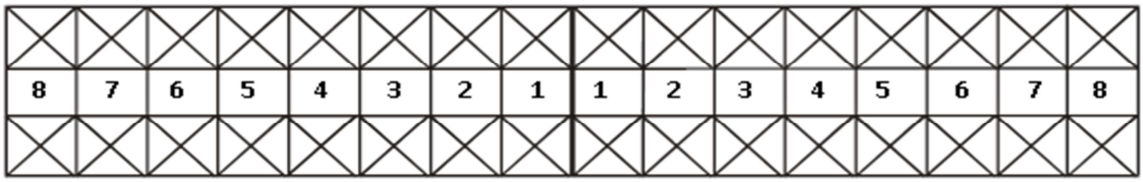
Comparison Between Microsurgical and Macrosurgical Techniques for the Treatment of Gingival Recessions using Coronally Advanced Flap and Platelet Rich Fibrin -A Randomized controlled clinical trial

- Case No: OPD No:
- Name:
- Age: □ex: Occupation:
- Address:
- Chief Complaint:
- Medical History:
- Dental history:

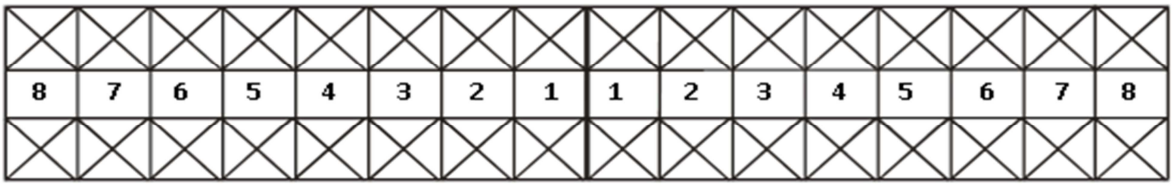
Gingival index (GI)- Loe H □ilness -1963



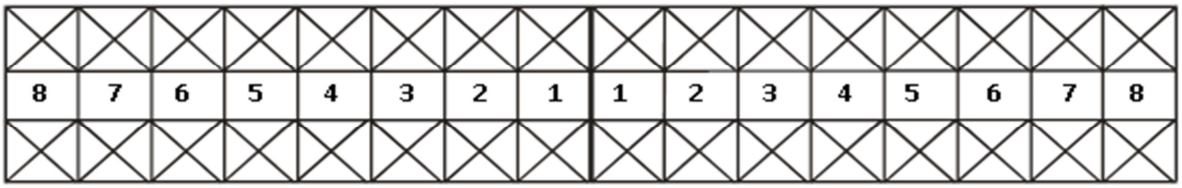
Height of gingival recession (HGR)



Probing depth (PD)



Clinical attachment level (CAL)



Width of keratinized tissue (WKT)

	15	14	13	12	11	21	22	23	24	25
Baseline										
1 month										
3rd month										

Thickness of keratinized tissue (TKT)

	15	14	13	12	11	21	22	23	24	25
Baseline										
1 month										
3rd month										

Visual Analog Pain Scale :

- The distance marked by patients along the 10cm line is measured with a ruler and a pain score out of 10 will be given
- 0 - No pain
- 1-3 - Slight pain
- 3- 6 - Moderate pain
- 6 -10 -Severe pain

Healing Index: (Landry et al -1988).

- 1-Very poor- ≥ 50% of red gingiva with suppuration
- 2-Poor - ≥ 50% of red gingiva
- 3-Good - 25-50% of red gingiva
- 4-Very good- < 25% of red gingiva
- 5-Excellent – All pink tissue

Clinical Parameters	Baseline	1 Month	3 Months
1.Height of gingival recession (HGR)			
2.Probing depth (PD)			
3.Clinical attachment level (CAL)			
4.Width of keratinized tissue (WKT)			
5.Thickness of keratinized tissue (TKT)			

Clinical parameters	Post surgically	3rd day	7th day
Visual Analog Pain scale			
Healing Index			

ANNEXURE – 6

MA□TER CHART

	1 week	4	4	4	3	3	3	4	2	4	4	2	2	3	3	3	3	3	2	3	3	2	2
HI	3rd day	3	3	3	2	2	2	3	1	3	3	2	2	2	3	3	2	2	2	2	2	1	2
	post op	2	3	2	1	2	1	2	1	2	2	1	1	2	2	2	1	2	1	2	2	1	1
	1 week	2	2	2	1	2	1	2	2	1	2	2	2	1	2	3	4	3	4	4	3	3	2
VAS	3rd day	4	3	5	3	4	4	3	5	4	4	4	5	4	6	4	5	5	6	6	4	6	5
	Postoperativeley	6	5	7	5	5	6	5	7	6	7	7	8	7	8	6	8	7	7	8	6	8	7
	3 months	5.3	4.8	5.23	4.63	5.78	4.99	4..2	4.6	4.7	4.4	1	4.9	3.9	4	4.7	3.6	3.7	2.7	4.2	4.8	4.8	4.9
TKT	1 month	4.7	4.5	4.87	4.4	5.6	3.8	3.9	4.4	3.2	3.2	2.9	4.6	3.5	3.8	4.4	3	3.33	2.55	3.9	4.2	4.4	4.8
	Baseline	4.56	3.9	3.5	3.86	4.79	2.67	2.89	3.52	2.68	2.6	3	4.5	3.4	3.8	4.22	2.89	2.76	2.5	3.6	3.89	4.1	4.3
	3 months	4.7	3.8	5.7	5.3	5.8	5.1	4.9	5.6	4.9	5.4	4.8	4.9	3.9	4	4.7	3.6	3.7	2.7	4.2	4.8	4.8	4.9
WKT	1 month	4.5	3.2	5.49	4.89	5.2	4.98	4.2	4.9	3.8	4.2	4.1	4.6	3.5	3.8	4.4	3	3.33	2.55	3.9	4.2	4.4	4.8
	Baseline	3.56	2.89	4.5	3.6	2.79	3.67	3.9	4.22	2.88	3.6	3.3	4.5	3.4	3.8	4.22	2.89	2.76	2.5	3.6	3.89	4.1	4.3
	3 months	2.56	3.33	3.89	1.99	1.8	2.1	0.9	1.1	1.5	0.3	0.8	1.13	1.23	2.2	2.89	2.4	3.3	1.6	0.9	2.3	0.98	1.89
CAL	1 month	3.56	2.98	4.45	2.43	3.56	4.3	2.99	3.7	2.89	3.99	3.6	2.89	3.34	4.89	3.9	3	4.46	2.8	2	3.3	2	2.89
	Baseline	4.8	3.6	5.8	3.2	4.43	5.2	3.7	4.9	3.5	4.1	4	3.4	4.9	5.2	4.6	3.5	5.3	3.1	2.89	4	2.23	3.68
	3 months	1.98	0.8	0.3	0.4	0.3	0.9	0.7	1.9	1.8	0.7	0.6	1.89	1.4	1.5	0.8	0.4	0.3	0.7	0.5	0.4	1.87	0.4
PD	1 month	2.1	1.08	1.97	0.8	0.3	2.1	0.9	2	2.1	0.9	0.9	2.1	1.98	1.78	1.5	0.8	0.89	0.9	1	1.2	2.4	1.89
	Baseline	2.56	1.89	2.9	1.4	0.89	2.7	1.3	2.28	2.9	1.8	2.1	2.56	2.1	2	2.7	1.76	1.5	1.1	1.8	1.9	2.6	2.2
	3 months	1.83	3.5	1.22	1.8	2.5	2.1	2	1.1	0.9	2.2	3.2	2.6	1.8	1.7	0.9	2.7	1.6	1.2	1.98	1.2	1.87	0.98
HGR	1 month	1.39	3.88	0.78	2.9	3.1	3.87	3.2	2	2.5	3.7	4.2	3.5	2.2	2.8	1.2	3.2	2.9	2	2.3	1.8	2.5	2.7
	Baseline	2.56	4.3	2.67	3.8	3.3	4.1	3.6	2.5	3.39	4.3	3.8	4.23	2.2	3.2	2.29	4.59	3.5	2.9	2.3	2.5	3.8	3.1
	3 months	0.58	0.41	0.22	0.62	0.2	0.5	0.3	0.2	0.82	0.4	0.52	0.3	7	0.4	0.8	0.5	0.3	0.7	0.8	0.2	0.6	0.7
GI	1 month	0.78	0.48	0.5	0.89	0.5	0.71	0.9	0.5	0.9	0.9	0.87	0.4	0.9	0.6	1	0.8	0.5	0.9	1.1	0.4	0.9	1.1
	Baseline	1.4	0.5	0.67	1	0.7	0.8	1.2	0.5	1.2	1.1	1.5	0.8	1.3	0.6	1.1	0.7	0.6	0.9	1.7	0.4	1.1	1.3
CODE		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
GROUP		Test	Test	Test	Test	Test	Test	Test	Test	Test	Test	Test	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
AGE		32	41	28	37	29	25	30	22	34	45	32	36	33	46	35	29	21	31	25	37	26	32
GENDER		F	M	M	F	F	F	M	F	F	M	F	F	M	M	M	F	F	F	F	M	M	M
SL NO		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22