# COMPARISON OF TWO DIFFERENT SUTURE MATERIAL ON PERIODONTAL FLAP HEALING, INFLAMMATORY REACTION, AND CLINICAL PARAMETERS–A RANDOMIZED HISTO-CLINICAL STUDY

**DISSERTATION**

**Submitted to**

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**LUCKNOW, UTTAR PRADESH**

***In the partial fulfilment of the requirements for the degree***

***of***

**MASTER OF DENTAL SURGERY**

**In**

**Periodontology**

**By**

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**Under the guidance of**

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**I hereby declare that this dissertation entitled "COMPARISON OF TWO DIFFERENT SUTURE MATERIAL ON PERIODONTAL FLAP HEALING, INFLAMMATORY REACTION, AND CLINICAL PARAMETERS – A RANDOMIZED HISTO- CLINICAL STUDY." is a bonafied and genuine research work carried out by me under the guidance of Dr. Mona Sharma, Professor and Head, Department of Periodontology, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.**

**Date:** 10-Feb-2024

**Place:** Lucknow

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गुरुर्ब्रह्मा ग्रुरुर्वरष्ुुुः गुरुर्देवो महेश्वरुः ।

गुरुुुः साक्षात् परं ब्र्ह्म तस्मै श्री गुरवे नमुः ॥

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Dr DEEPIKA MISHRA

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The most common medical device used for closing wounds is a suture. Its primary function being to sustain the tissues until healing process restores sufficient tensile strength and surface continuity. Several suture materials, including absorbable and non-absorbable, natural and synthetic, monofilament and multifilament, are used to close wounds in periodontal surgery. The non-absorbable sutures that are most frequently used are nylon, polyester, synthetic polypropylene and natural silk. silk has been the suture material of choice in dentistry as it is Inexpensive and simple to use. Due to its multi-filamentous (braided) nature, silk has been demonstrated to "wick," which causes fluid and bacteria to collect around the surgical wound. Polypropylene is synthetic mono- filamentous, and its tensile strength won't deteriorate with time. It has a low coefficient of friction, is inert, easily penetrates tissue, and has good knot security. The primary drawback of this suture material is tissue irritation caused by the suture material's cut ends. This study compares the effects of two different suture materials (silk and polypropylene) used in periodontal flap surgery on soft tissue healing, inflammatory response, and clinical parameters. The rationale behind the comparison is the advantages and disadvantages of each suture material.

A split mouth study, 60 quadrants total in 30 subjects randomly divided into two groups-In Group I, after thorough debridement the flaps were repositioned and sutured with Non Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon, Johnson and Johnson Waluj ,Aurangabad ,India)$^{TMV06}$In Group II, after the complete debridement the flaps were repositioned and sutured with Non-Absorbable, Synthetic, Monofilament Polypropylene Suture.(Ethicon, Johnson and Johnson, Waluj ,Aurangabad, India)$^{TMVO4}$Clinical parameters of VAS Scale ,Gingival Index , Patients comfort were assessed at seventh day post surgically. Histologic study was performed, to assess inflammatory response of the tissue by assessing inflammatory cells.

On comparing both the suture materials it was seen that Polypropylene showed better healing as per Landry et al and showing less inflammatory cells, better Gingival Index.

However, silk sutures showed better clinical handling by the operator and patients had more comfort postoperatively. The no of missing sutures was also less in the silk suture group.

Periodontium is a specialized tissue that surrounds and supports the teeth. The periodontium supports the tooth, protects it against oral microflora, and makes the attachment of the tooth to the bone possible.[1]

Periodontitis, an inflammatory condition of the periodontium brought on by particular microorganisms or groups of distinctive microorganisms, leads to the formation of periodontal pockets, gingival recession, or both, as well as the gradual destruction of the periodontal ligament and the alveolar bone.[2]

There is no specific age at which periodontitis would most likely start, and it is seen that the prevalence, severity, and extent of the disease increases steadily with age. Each patient has a different rate at which their periodontitis develops.[3]

The periodontal pocket provides ideal conditions for the proliferation of microorganisms. However, there is a chance for a subsequent damaging phase if it persists and keeps harbouring the disease-causing microbes. The Periodontitis can then need a lengthy course of treatment.

As a result, the elimination of the periodontal pocket and the clearing of the subgingival infection are prioritized in the treatment of periodontitis.[4]

Elimination of local etiologic factors is of penultimate importance and can be achieved by periodontal therapy. Scaling alone is sufficient to remove plaque and calculus completely from enamel, leaving a smooth, clean surface. However, in certain cases all the local factors cannot be eliminated via non-surgical therapy due to a lack of access, poor vision, etc.

Many moderate to advanced cases cannot be resolved without surgically gaining access to the root surface for root planing and reducing or eliminating pocket depth to allow the patient to remove biofilm.[5] In such cases, open approach or surgical phase therapy is the method of choice as it provides adequate visibility and access to the underlying bone and root surface followed by placement of sutures.

Sutures are the most frequently used medical device for wound closure. Its essential role is to support the tissue until continuity of surface and enough tensile strength is regained during the process of wound healing.[6]

In periodontal surgery, various suture materials are used for wound closure; they are Absorbable and Non absorbable, Natural and Synthetic and, Monofilament and Multifilament etc [7] The most commonly used Non absorbable sutures are natural silk, synthetic polypropylene, polyester and nylon.

Silk's low cost and ease of handling have made it the most widely used suture material in dentistry. Silk suture material has a significant drawback in that it has been demonstrated to "wick," which causes bacteria and fluid to accumulate in the surgical wound. Silk is multifilamentous, or braided.

Since polypropylene is monofilamentous, its tensile strength does not deteriorate with time. It has good security, passes through tissue with ease, has a low coefficient of friction, and is inert.

The primary drawback of this suture material is that its cut ends cause tissue irritation.[8]Taking into account the benefits and drawbacks of different suture materials, this study compares the performance of two distinct suture materials (Silk and poly propylene)used in periodontal flap surgery on soft tissue healing, inflammatory reaction and clinical parameters.

**AIM:**

The aim of the present study is to assess and compare the two commonly used suture material in periodontal flap surgery with respect to soft tissue healing, inflammatory reaction and clinical parameters at seventh day postoperatively.

**OBJECTIVES:**

1) To assess operator's clinical handling convenience the different types of suture materials.

2) To be assessed at $7^{th}$ day postoperatively

i. Gingival Index by (Loe and Silness1963)
ii. Patient Comfort by V A S Scale (Hayes and Patterson 1921)
iii. Number of Missing Sutures
iv. Degree of Gingival Healing by Landry Healing Index 1988.
v. Inflammatory reactions by Histological Analysis

**Seivig. Knut A Leknes Knut N. (1998)**[9] conducted the study in which tissue reactions to natural and synthetic braided and monofilament suture materials in gingiva and oral mucosa were studied. Study concluded that chromic gut sutures are rapidly and unpredictabily absorbed when used in an environment characterized by moisture and Infectious potential.

**Otten et al (2004)**[10] conducted a study on resorbable (Monocryl) and nonresorbable (Deknalon) monofilament sutures used in intraoral dentoalveolar surgery and the bacterial colonization was compared. For the in vivo study the sutures were applied in 11 patients during dental surgery. Eight days postoperative the sutures were removed and the adhered bacteria were isolated and identified by biochemistry, morphology, antibiotic susceptibility.Study concluded that The colonization rate of Streptococcus intermedius on both sutures was similar. Coccoid bacteria within biofilms were seen. The growth of Prevotella intermedia was much better on Deknalon than on Monocryl.

**Banche G et al (2007)**[11] done a study on Microbial Adherence on Various Intraoral Suture Materials in Patients Undergoing Dental Surgery. During dentoalveolar surgery, various suture materials were used in 60 Patients, who were randomly divided into 5 groups of 12. The result of the study, In all 60 patients, silk sutures exhibited the smallest affinity toward the adhesion of bacteria compared with considerable proliferation with nonresorbable multifilament sutures.

**Kulkarni, et al 2007**[12] carried out the study to assess the healing of the periodontal flaps when closed with the conventional silk sutures and N-butyl cyanoacrylate. Study concluded that healing with the cyanoacrylate is associated with less amount of inflammation during the first week when compared with silk. However, over a period of 21 days to 6 weeks, the sites treated with both the materials showed similar healing patterns**.**

**Sortino f et al (2008)**[13] conducted a comparative study on Silk and polyglycolic acid suture in oral surgery. The inflammatory reaction caused by 2 different suture materials, black silk and polyglycolic acid, was evaluated 8 days after application and permanence in the oral environment.

The result of the study, The inflammatory reaction of gingival tissues was lower for polyglycolic acid compared to silk sutures.

**Jathal et al (2008)**[14] reported two patients in whom flaps were closed using fibrin in the first patient and sutures in the second. The aim was to check the consequence of fibrin sealant as an alternative to sutures. There was a definite ease of usage on the part of clinician of the fibrin glue, while there was painless and early recovery of the glued area in the first patient as compared to the sutured area in the second patient.

**Vicente O P et al (2010)**[15]conducted a comparative study between two Different suture materials (silk vs. Teflon-coated, multi-filament braided polyester threads suture) in oral implantology. Ten edentulous patients or partially edentulous patients were surgically treated for implant installation. Each side was sutured with either, randomly selected one or the other suture material. The results showed a more pronounced plaque accumulation for silk sutures but there was not a statistical difference. The intraoperative handling of the silk sutures was less comfortable and the patient comfort was worse than Teflon-coated polyester suture.

**Kumar V Raj, Rai AB ,Yadav Priya (2010 )**[16]conducted the study s to compare and contrast the effects on healing of intraoral wounds in cases of alveoloplasty when closure was carried out by n-Butyl cyanoacrylate and black braided silk suture through the assessment of amount of time taken to achieve wound closure, Immediate and post-operative bleeding, Post-operative pain and incidence of post operative wound infection. The study concluded that n-butyl-2-cyanoacrylate can be used for intra oral wound closure effectively. The procedure is relatively painless &quick. The material causes less tissue reaction and achieves immediate homeostasis. Added to this are benefits of protection from wound infection since the material is bacteriostatic.

**Javed F et al. (2012)**[17] conducted the study aim of this study was to review the tissue reactions to the various suture materials used in oral surgical interventions. cotton, nylon, polyglecaprone25, polytetrafluoroethylene (ePTFE), Polyglactin 910, polyglycolic acid (PGA), polylactic acid, silk, surgery, suture, and tissue reaction.Study concluded that polyglecaprone 25

had positive effects on wound-healing as compared to silk. Six studies reported that silk elicits more intense tissue inflammatory response and delayed wound healing as compared to other suture materials (including ePTFE, polyglecaprone-25, PGA, and nylon). Polyglactin 910 sutures were associated with the development of stitch abscess in one clinical study. Eight studies reported that tissue reactions are minimal with nylon sutures.

**Pons-Vicente et al [2012]**[18] conducted a study in which ten edentulous or partially edentulous patients were surgically treated for implant installation Each side was sutured with either, randomly selected one or the other suture material. Seven days post surgically, the sutures were removed and three knots per patient and side were collected for microbiological testing. Study concluded that more pronounced plaque accumulation for silk sutures but there was not a statistical difference. The intraoperative handling of the silk sutures was less comfortable and the patient comfort was worse than Teflon-coated polyester suture.

**M Mohamed et al (2013)**[19] conducted the study to determine the favoritism of suture materials among a group of clinicians at a teaching institution.The study concluded that absorbable sutures were preferred in the majority of periodontal procedures; however, non-absorbable sutures were favored in procedures that required longer healing or better stability of the flap edges in cases of periodontal and ridge augmentation.

**Pulikkotil et al (2013)**[20] conducted study which compared wound healing clinically, histologically and morphometrically after the use of fibrin sealant and sutures for periodontal flap closure. Ten patients were selected for this split-mouth randomized controlled clinical trial. On the test site fibrin sealant was applied for flap closure after periodontal flap surgery and on the control site sutures were used. Clinically wound healing was observed at 7, 14 and 21 days and biopsy was taken on the 8th day. At seventh day better healing was observed in fibrin sealant site. Histologically mature epithelium and connective tissue formation was seen in fibrin sealant site with increased density of fibroblasts and mature collagen fibers. The suture site had a greater number of inflammatory cells and more number of blood

vessels. Fibrin sealant can form a better alternative to sutures for periodontal flap surgery.

**Israr muhammad et al (2013 )**[21]conducted the study to compare the healing, the type of micro-organisms around the suture material, pain score during removal of suture / staple and cost of the closure material per patient. Sixty patients were allocated in 4 groups. Each group had 15 patients, aged 16 to 70 years of age with isolated fractured zygoma. They were prospectively randomly selected to have staple, silk, prolene or vicryl rapide for closure of their scalp incision. Patients returned at a week for staple or suture removal, a culture swab, pain score and evaluation of healing. Patients were then reviewed at 6 to 8 weeks' time to re-evaluate the healing of the temple / scalp wound. Study concluded that There was no difference in healing in all four groups but staples were easier and faster and had less micro-organisms growth around them. Staples are more expensive and more painful on removal when compared to other groups. The main advantage of vicryl rapide was that there was no need for removal and had comparable results. Silk had the same results as the other groups but is considerably cheaper when compared to the other materials.

**Dikişet F et al (2016)**[22] conducted a 2-year longitudinal study to access the effect of different suture material on tissue healing with 20 subjects.

In this study no statistically significant difference was observed between the groups regarding the density of the cells, necrosis, fibrosis, foreign body reaction, and the presence of the cells of acute & chronic infections. Of note, propylene showed slightly less tissue reaction among the other materials.

**Dragovic et al (2019)**[23]conducted the study in which total number of 32 patients undergoing surgical extraction of four impacted third molars were involved. Clinical parameters were estimated intraoperatively and during the control check-ups. Soft tissue healing around sutures were evaluated on the 3rd and 7th day postoperatively.

Non resorbable polypropylene suture showed superior clinical characteristics among all sutures, Moreover, the best healing of soft tissue and the least inflammatory reaction was found around this thread.

**Munjal et al (2021)**[24] conducted a study in which total number of 30 patients undergoing periodontal surgery were selected and divided into two groups based on type of suture material. Group 1 and Group 2 (n=15) consist of 15 patients where suturing was done with polytetrafluoroethylene suture and silk suture (3-0).

Study concluded that the blood and mitis salivarius agar there was no statistically significant difference in of colony counts among PTFE group & Silk group respectively.

**Soundarajan et al (2021)**[25]assessed the post operative healing and stability of flap closure using autologous fibrin glue when compared to silk suture. Parameters assessed & tests performed - The roll test for flap closure stability was used to verify the flap's adhesion. The postoperative healing was evaluated using the simplified healing index. Narendran et al (2021)35 evaluated the effectiveness of autologous platelets.

**Denta Aditya Prasetya et al (2021)**[26] conducted the study to determine the amount of attachment of Streptococcuss mutans to suture materials such as nylon, polypropylene and triclosan-coated polyglactin 910 commonly used in intraoral sutures. The study concluded that the lowest amount of attachment of S. mutans was found in nylon and the highest was in triclosan-coated polyglactin 910.

**Chithra A et al (2021)**[27] Conducted the study aim of this study was to compare the use of absorbable antibacterial suture material with silk suture in the procedure of lower third molar extractions.30 subjects with impacted lower third molars were randomly divided into two equal groups. The control group had wound closure with silk suture and test group with absorbable antibacterial suture. Subjects were followed up for one month postoperatively. Postoperative pain, swelling, mouth opening, food lodgment, socket size and complications were evaluated. Study concluded that no significant difference was observed in the postoperative swelling, mouth opening, food lodgment. There was statistically significant difference in pain and socket diameter between two groups.This study shows that the use of antibacterial suture gives slightly better patient

acceptance than silk suture in managing the postoperative sequelae of impacted third molar extraction.

**Khurana Jyotsana Veneet et al (2022)[28]** conducted a study which aims to compare healing after periodontal flap surgery using isoamyl 2 cyanoacrylate (bioadhesive material) and silk sutures. The study was carried out on twenty patients who needed flap surgical procedure for pocket therapy. Study concluded that difference was seen in the 2nd week when both the materials were compared Early healing was seen with isoamyl 2-cyanoacrylate during the 1st week when compared with silk. However,the difference was statistically no significant.

**Sharma M. Neha1, lochana Priya (2022)[29]** conducted the study to compare healing following stage 1 implant placement by two different suture materials, the case records of patients undergoing implant placement were collected by reviewing and analyzing the records and data recorded from 86,000 patients between November 2020 and January 2021. Patients undergoing implant placement were selected. The data of 40 patients undergoing implant placement in the lower posterior endetulous region was collected and divided into two groups - 20 patients each - a black silk group and a polyamide suture group.The study concluded that polyamide suture showed better healing compared to the black silk suture group, a significant difference being recorded in the wound healing index of the two groups.

**Raut D et al (2022)[30]** conducted the study to perform a systematic review and meta-analysis of dehiscence rate in wound closed with cyanoacrylate and black braided silk after surgical removal of impacted third molar. Study concluded that there is no difference in the dehiscence rate of wound closed with cyanoacrylate and black braided silk suture.

The prospective, split-mouth randomized clinical trial was carried out in the Department of Periodontology, Babu Banarasi Das Collage of Dental Sciences (BBDCODS), Lucknow India. Ethical clearance was obtained from the ethical committee of BBDCODS IEC CODE 33); Patients fulfilling the following inclusion and exclusion criteria were selected from the OPD of the Periodontology Department of BBDCODS. Since it was a split mouth study total of 30 patients (60 quadrants) were included in the study.

Inclusion criteria**:**

i. Patient suffering from Chronic Periodontitis having ≥ 5mm deep periodontal pockets in 5 or more teeth in a quadrant.
ii. Atleast two separate quadrants involved in the same patient
iii. Age range 25-50 years.
iv. Minimum 24 permanent teeth.
v. Systemically healthy individuals.
vi. Non-smokers and non-tobacco chewers.
vii. No history of antimicrobial therapy for the past 6 months.
viii. Patients who give consent for inclusion in the study after thorough explanation of the study to the patient.

Exclusion criteria:

i. Pregnant and lactating females.
ii. Patients with a history of trauma in the past 6 months.
iii. Patients on phenytoin, calcium channel blockers, and cyclosporine medication.
iv. Patients suffering from any infectious or systemic disease.
v. Five or more carious lesions requiring immediate restorative treatment

Patient underwent SRP and Orthopantomogram (OPG) were taken , After one week patients were recalled for surgery. At this time Pocket Probing Depth was recorded and the patients were randomly divided into two groups.

Group I- Periodontal Flap Surgery with Non-Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon,Johnson and Johnson Waluj ,Aurangabad, India)[TMV06]

Group II- Periodontal Flap Surgery with Non-Absorbable, Synthetic, Monofilament Polypropylene Suture. (Ethicon, Johnson and Johnson, Waluj, Aurangabad, India) [TMVO4]

In both the groups assessment of post- operative comfort, through V A S Scale (Hayes and Patterson 1921), Assessment of soft tissue healing using Landry Healing Index 1988., Inflammatory reactions assessed through histological analysis , Sutures were counted at the time of placement and at the time of removal after 7 days. A mention of number of missing sutures were made.The gingival index Loe and Silness 1963 evaluated and Operators, s clinical handling convenience assessed by a self prepared index.

Material and equipment used in this study are –

**Armamentarium**

Mouth mirror

Tweezers

Explorer

Hu-Friedy‘s UNC 15 Graduated periodontal probe

BP Handle

Blade- 12 no., 15 no.

Periosteal elevator

Curettes

Castro Viejo Scissors

Needle Holder

Scissor

Mixing Spatula

Kidney Tray

Betadine

Saline

Photographic Mirror (Occlusal, Buccal)

Sterile test tubes

Suture –Non-Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon Johnson and Johnson Waluj, Aurangabad,India)[TMV06]

Non Absorbable, Synthetic, Monofilament Polypropylene Suture. (Ethicon Johnson and Johnson,Waluj, Aurangabad,India)[TMVO4]

COE -PAK GC America Inc. Illinois, USA[TM]

Solution for tissue processing

Microscope

A pre-procedural mouth rinse with 5 ml of betadine in dilution was done in order to reduce the bacterial load. Throughout the surgical procedure, asepsis was maintained. Area subjected to surgery was anaesthetized by nerve block/local infiltration depending on the site using 2% lignocaine containing adrenaline at a concentration of

1:200,000, Lignox 2% A, Indoco Remedies Ltd. Using a #15 Bard Parker blade, sulcular incisions were made on the facial and palatal/lingual aspects of the operative area, extending all the way to the crest of the alveolar bone. On both the palatal/lingual and facial sides, incisions were extended to one tooth mesial and one tooth distal to the area of interest. Full-thickness flaps on the facial and lingual aspects were reflected using a periosteal elevator. A thorough debridement was carried out using the hand instruments after the flaps had been adequately reflected.

**In Group I**, after thorough debridement the flaps were repositioned and sutured to achieve a primary soft tissue closure with Non Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon, Johnson and Johnson Waluj ,Aurangabad,India)[TMV06]

**In Group II**, after the complete debridement the flaps were repositioned and sutured to achieve a primary soft tissue closure with Non-Absorbable,

Synthetic, Monofilament Polypropylene Suture. (Ethicon, Johnson and Johnson,Waluj ,Aurangabad ,India)[TMVO4]

The surgical area was protected and covered with the periodontal dressing (COE -PAK GC America Inc. Illinois, USA)[TM]. Each patient was kept under an antibiotic, analgesic coverage for 5-days.

At this point of time a note was made of –

i. Total number of sutures placed .
ii. Operators, clinical handling convenience was assessed by a self prepared index during the procedure for both the groups.

**Operators, Clinical Handling Convenience Index**

| Score | Interpretation |
|---|---|
| Score 1 | Convenient to use |
| Score 2 | Inconvenient to use |
| Score 3 | Cannot say |

Periodontal dressing and sutures were removed 1-week post-surgery. Each patient was encouraged to begin mechanical oral hygiene, which entails using a soft toothbrush and the Charter‘s technique to brush their teeth gently, and to refrain from utilizing any kind of interdental cleaning tools in the surgically treated area for four weeks after the procedure.

At the time of suture removal patients were assessed for the following parameters:

**1) The Gingival Index ( Loe and Silness 1963)**

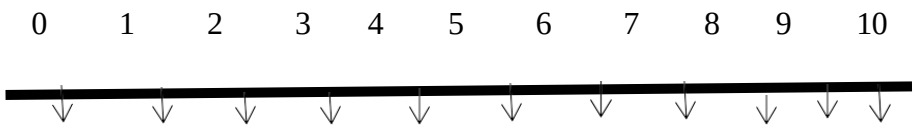
The bleeding is assessed by probing gently along the wall of soft tissue of the gingival sulcus. The scores of the four areas of the tooth can be summed and divided by four to give the GI for the tooth. The GI of the individual obtained

by adding the values of each tooth and dividing by the number of teeth examined.

| SCORE | CRITERIA |
|---|---|
| Score 0 | Normal gingiva |
| Score 1 | Slight change in color, slight edema no bleeding on probing |
| Score 2 | Redness, edema, glazing. Bleeding on probing. |
| Score 3 | Marked redness and edema, ulceration. Tendency toward spontaneous bleeding |

| SCORE | INTERPRETATION |
|---|---|
| 0.1-1.0 | Mild inflammation |
| 1.1-2.0 | Moderate inflammation |
| 2.1-3.1 | Signifies severe inflammation |

2) **Pain and Patient Comfort by Visual Analog Scale (Hayes and Patterson 1921)**: Patient were asked to indicate the intensity of pain over the past 7 days on a scale of 0 (no pain) to 10 (worst pain imaginable)



3) Number of sutures were counted at the time of suture removal.

4) **Soft Tissue Healing by Landry et al(1988)**

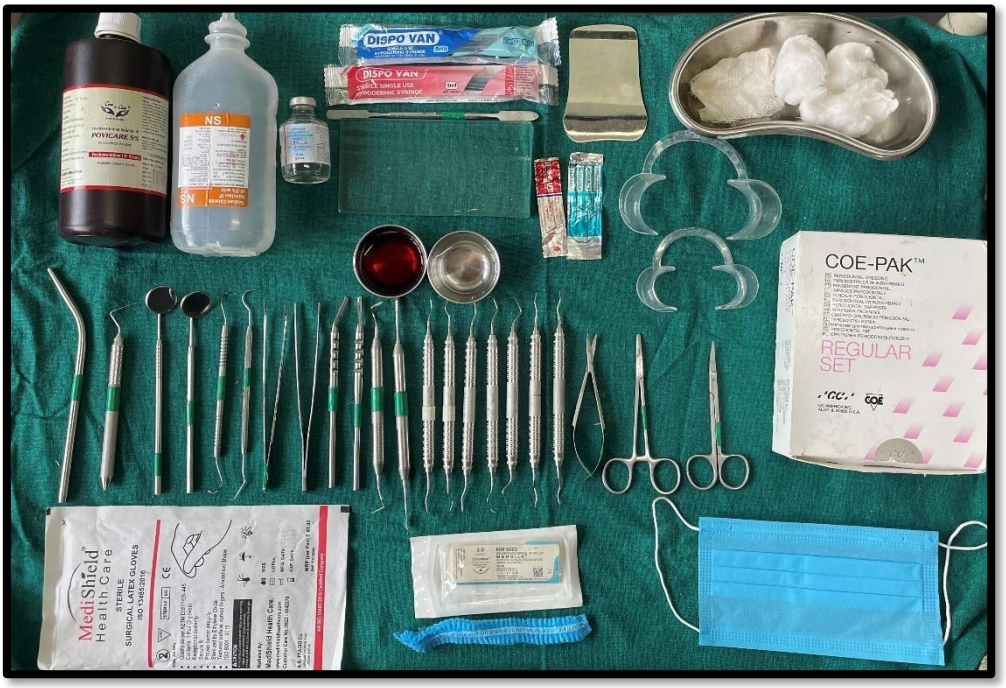
| INTERPRETON | DISCRIPTION |
|---|---|
| Very poor: | Tissue color: ≥50% of gingiva red<br>Response to palpation:Bleeding<br>Granulation tissue: Present<br>Incision margin:<br>Not epithelialized, with loss ofepithelium beyond incision margin<br>Suppuration: Present |
| Poor: | Tissue color: ≥50% of gingiva red<br>Response to palpation: Bleeding<br>Granulation tissue: Present<br>Incision margin: Not epithelialized,with connective tissue Exposed |
| Good: | Tissue color: ≥25% and<50% of gingiva red<br>Response to palpation:No bleeding<br>Granulation tissue: None<br>Incision margin: No connective tissue exposed |
| Very good: | Tissue color: <25% of gingiva red<br>Response to palpation:No bleeding<br>Granulation tissue: None<br>Incision margin: No connective tissue exposed |
| Excellent: | Tissue color: All tissues pink<br>Response to palpation: No bleeding<br>Granulation tissue: None<br>Incision margin: No connective tissue exposed |

**5) The Histological Analysis –** At the time of suture removal the part of the suture that was implanted in the tissue was sectioned separately, along with the knot.This was then immersed in 10% formalin solution. After fixation in ethyl alcohol, samples were embedded in paraffin and serial sections. Sections were stained with hematoxylin and eosin (H&E) and examined under microscop in 40x magnification. Inflammatory cells were counted on each suture sample and on the basis of average number, evaluation of inflammatory reaction was done.

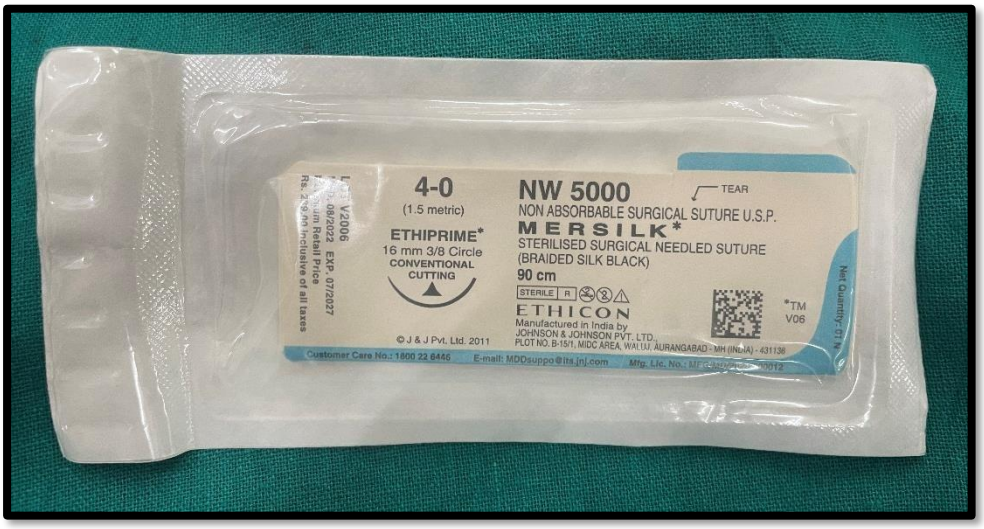
| Inflammatory Reaction | Number Of Inflammatory Cells |
|---|---|
| NO Inflammatory reaction | 0 inflammatory cells |
| MILD inflammatory reaction | <30inflammatory cells |
| MODERATE inflammatory reaction | 30-60 inflammatory cells |
| STRONG inflammatory reaction | >60 inflammatory cells |

The data collected was subjected to statistical analysis. Recall appointments were scheduled for re-evaluation and to assess the healing and flap stability.Patient were recalled and the reinforcement of oral hygiene instructions were done at each appointment'

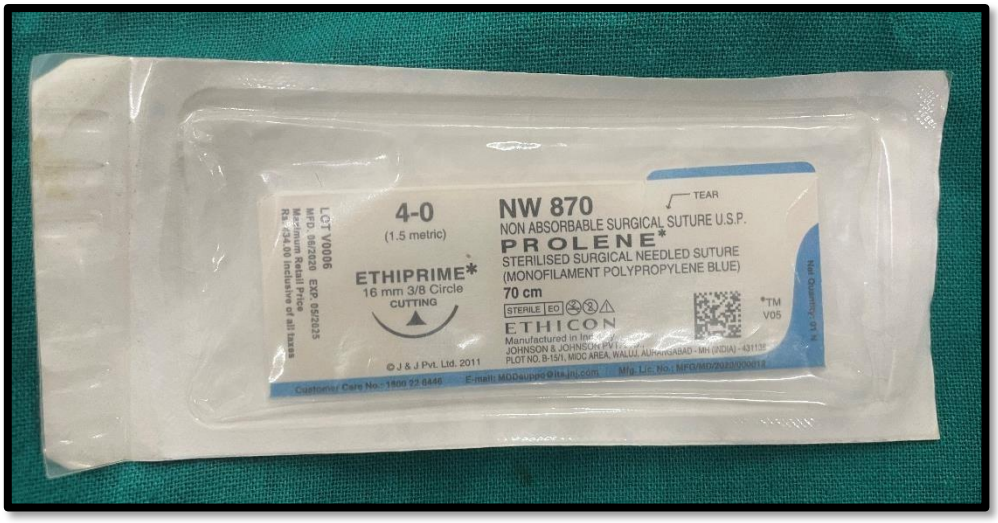
# SURGICAL ARMAMENTARIUM



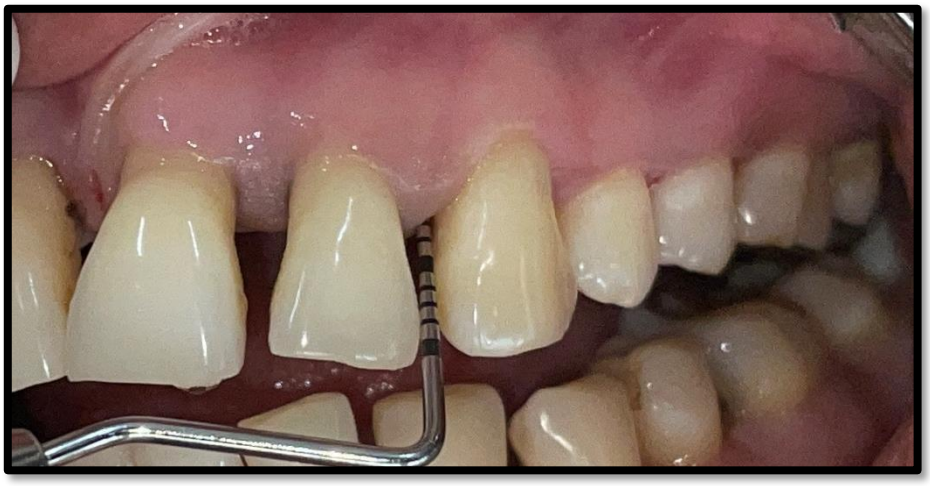

**Photograph 1: Armamentarium for Open Flap Debridement in Group I and Group II**



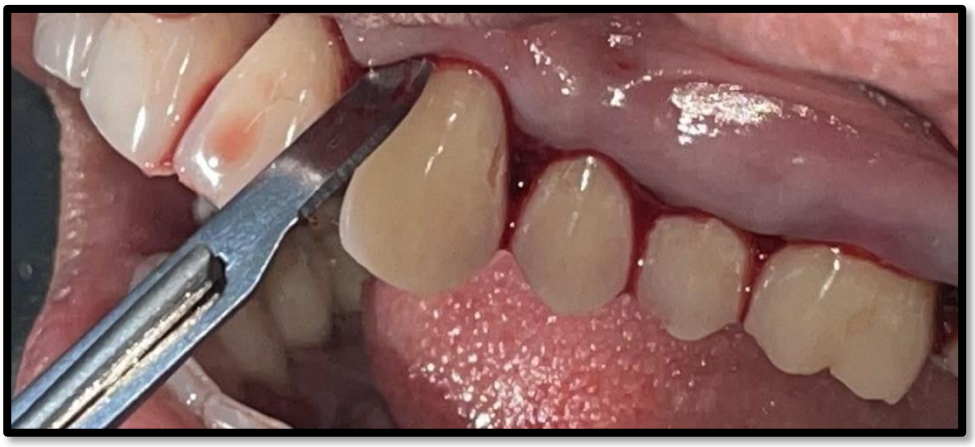

**Photograph 2 Non Absorbable, Natural, Multifilament Wax Coated Silk Suture.(Ethicon, Johnson and Johnson Waluj ,Aurangabad,India)$^{TMV06}$ for Group I**



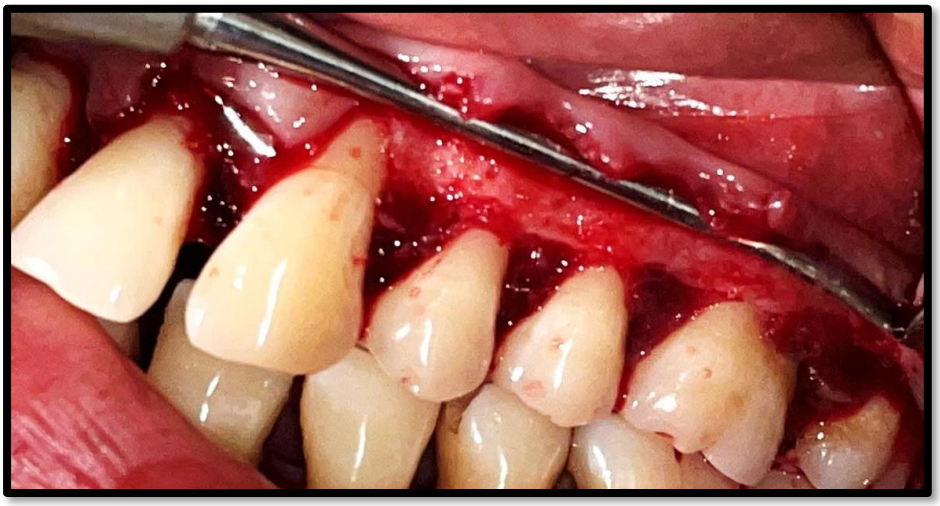

**Photograph 3 Non -Absorbable,Synthetic,Monofilament Polypropylene Suture.(Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)$^{TMVO4}$ for Group II**



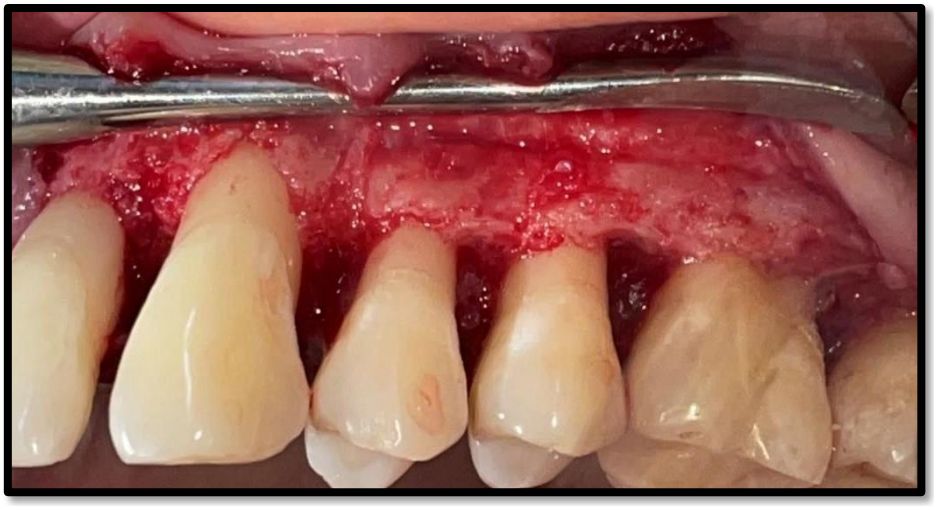
**Photograph 4-Pre-Operative Probing Pocket Depth**



**Photograph 5- Creviculer Incision being given**

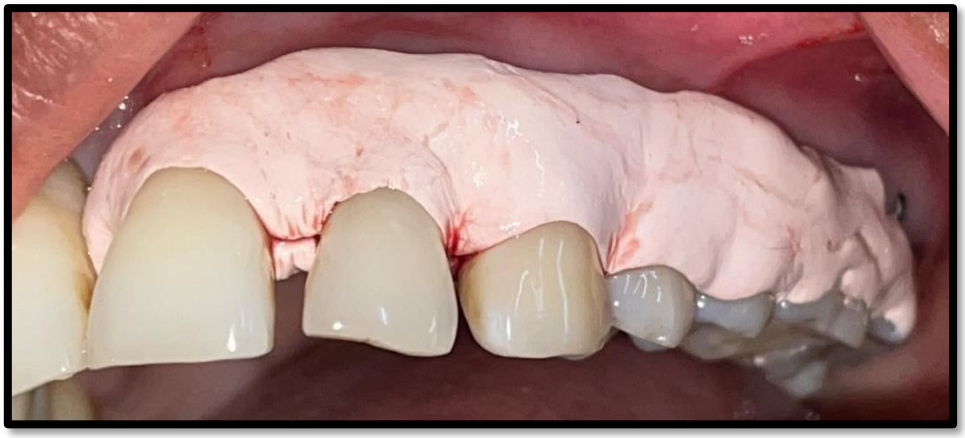


**Photograph 6**: Reflection of the Mucoperiosteal flap

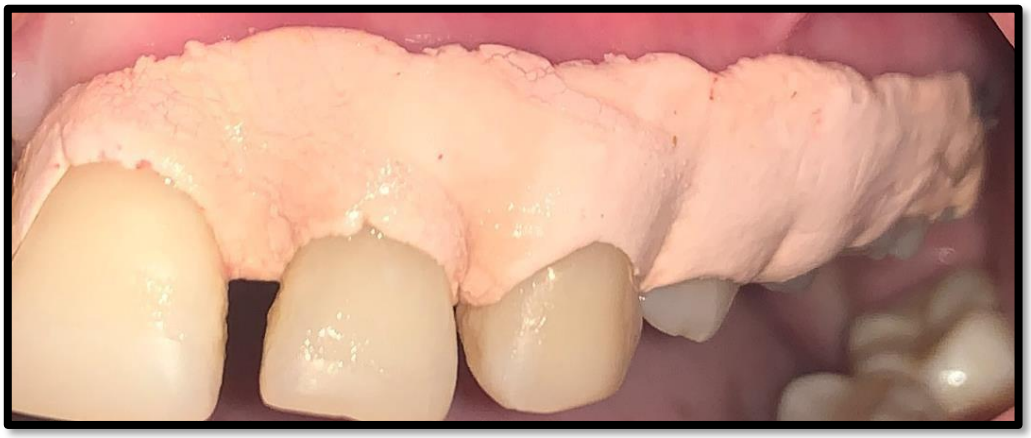


**Photograph 7: After removal of granulation tissue**

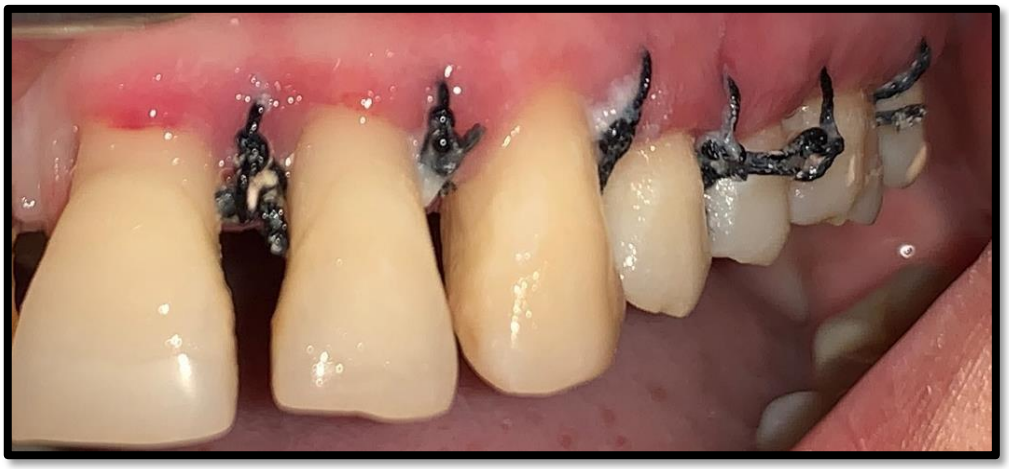
**Photograph 8: Flap approximated with Non Absorbable, Natural, Multifilament Wax Coated Silk Suture.(Ethicon, Johnson and Johnson Waluj ,Aurangabad,India)$^{TMV06}$in place.**



**Photograph 9: Periodontal Dressing**

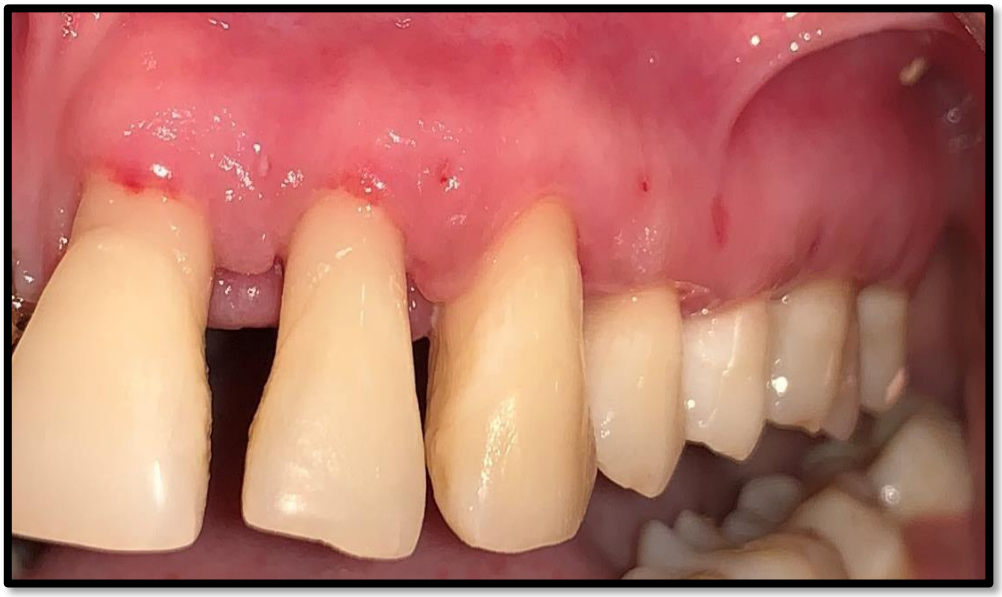


**Photograph 10: Periodontal Dressing after 1 week follow up**

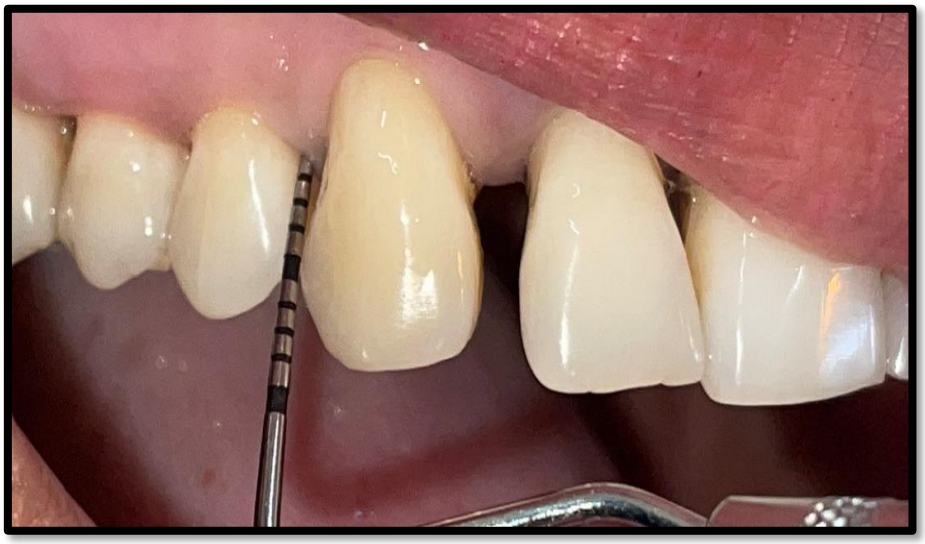


**Photograph 11;1 week post operative view of Non Absorbable, Natural, Multifilament Wax Coated Silk Suture.(Ethicon, Johnson and Johnson Waluj ,Aurangabad,India)$^{TMV06}$ in place**

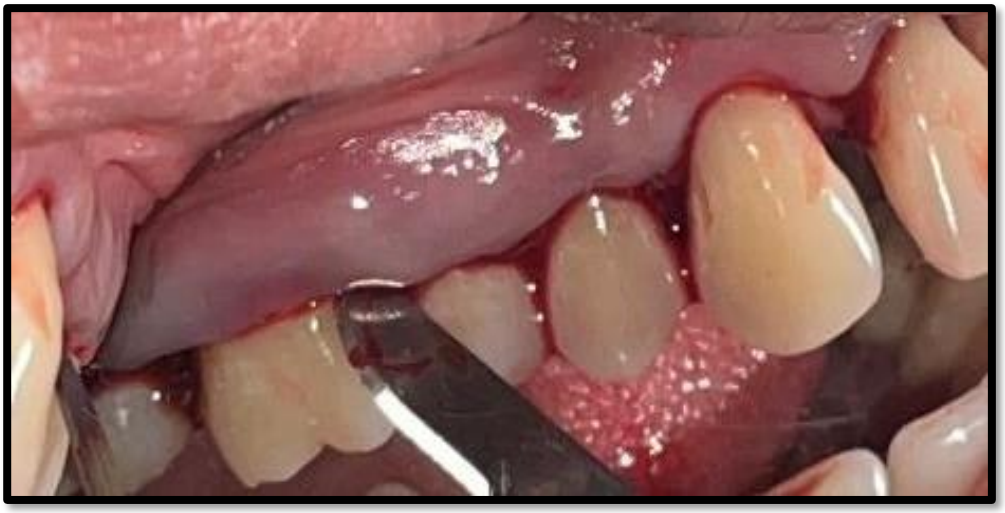
.



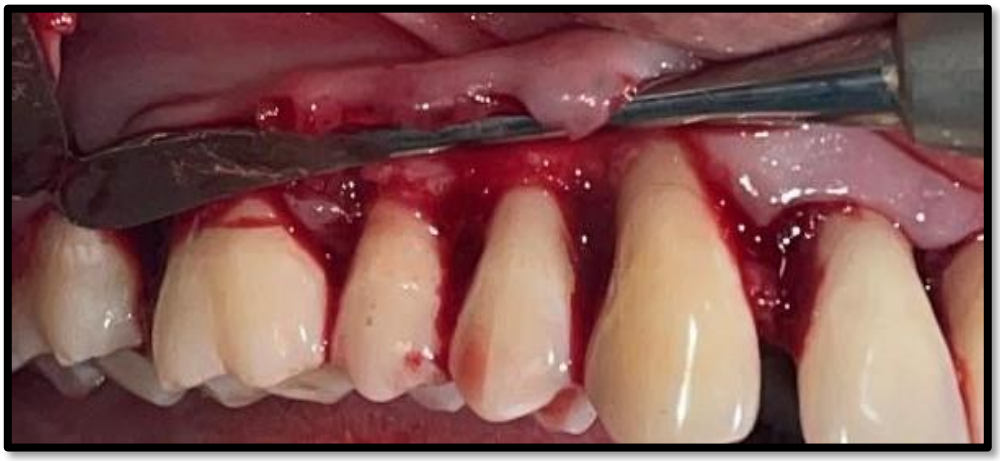
**Photograph 12-1 week post operative view after suture removal**



**Photograph 13- Pre-Operative Probing Pocket Depth**

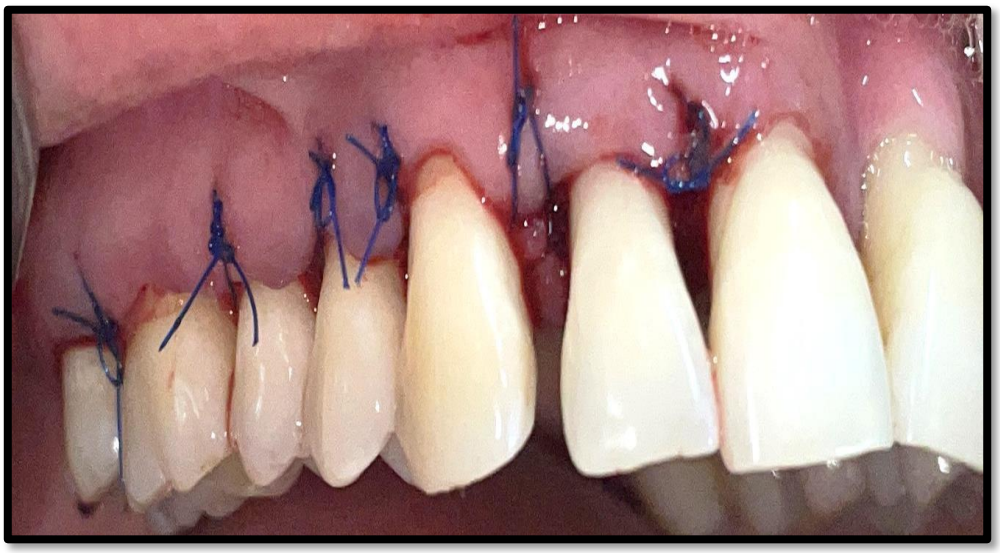


**Photograph 14-Creviculer Incision**

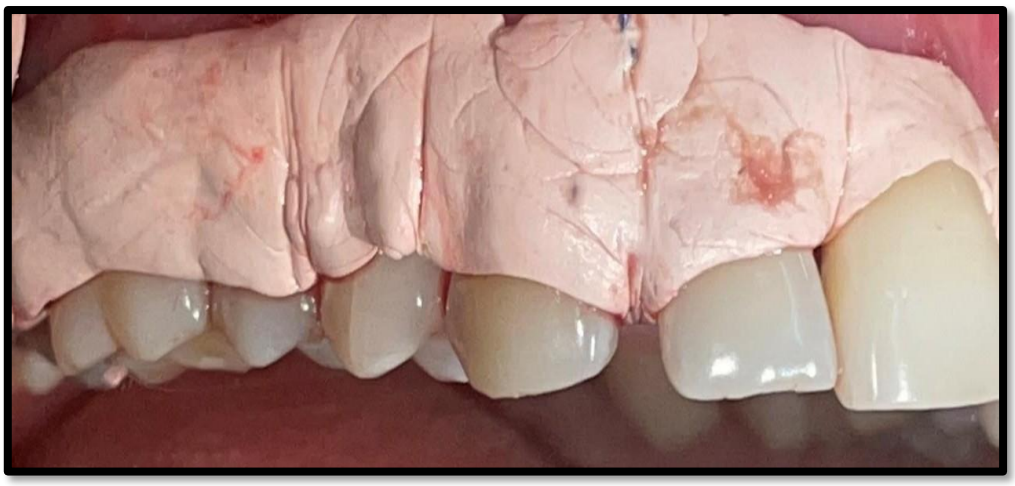


Photograph 15- Reflection of the Mucoperiosteal flap

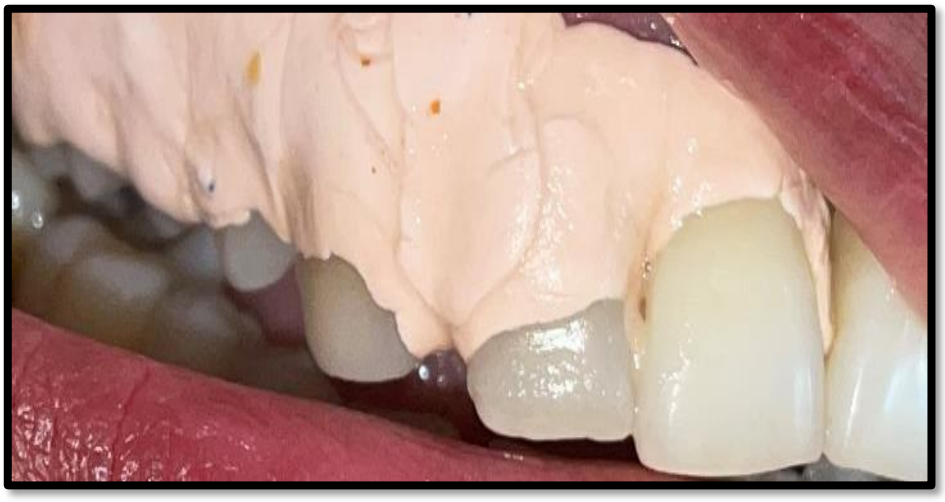
photograph 16-After removal of granulation tissue



**Photograph 17- Non Absorbable,Synthetic,Monofilament Polypropylene Suture. .(Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)$^{TMVO4}$**

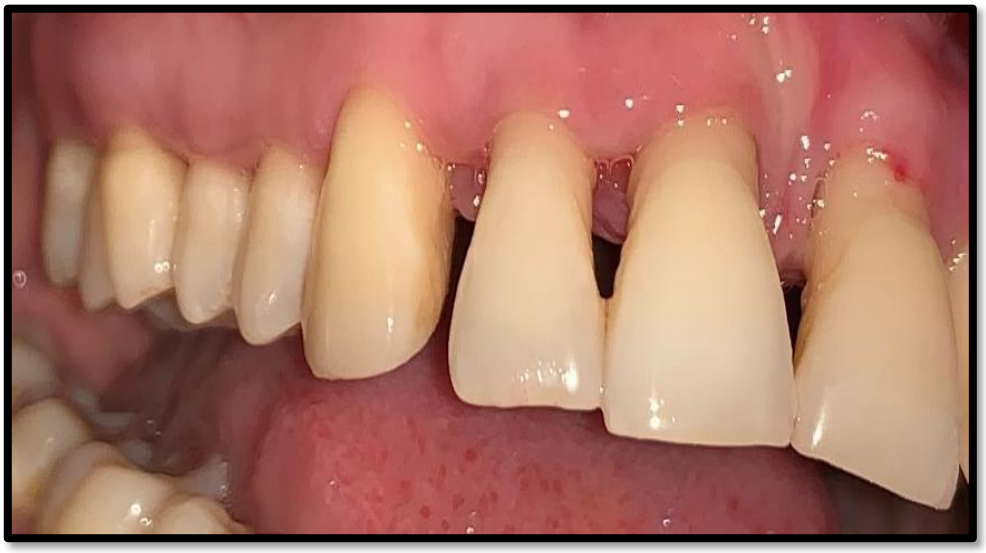


**Photograph 18-Periodontal Dressing**



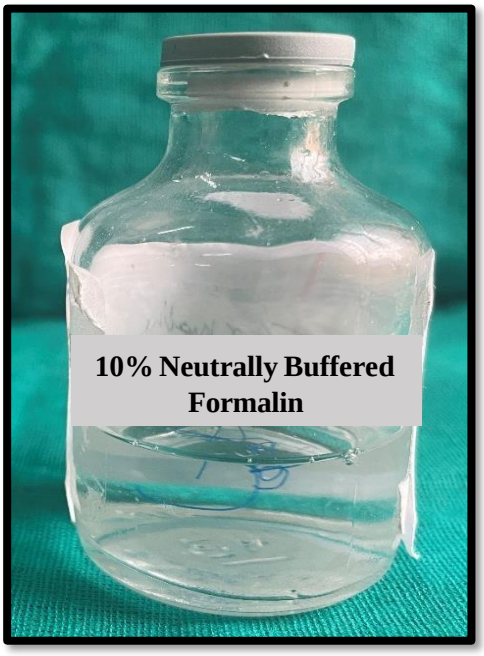
**Photograph 19- 1 week post operative view of Periodontal Dressing**

**Photograph 20- 1 week post operative view of Non ,Synthetic,Monofilament Polypropylene Suture. (Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)$^{TMVO4}$in place**

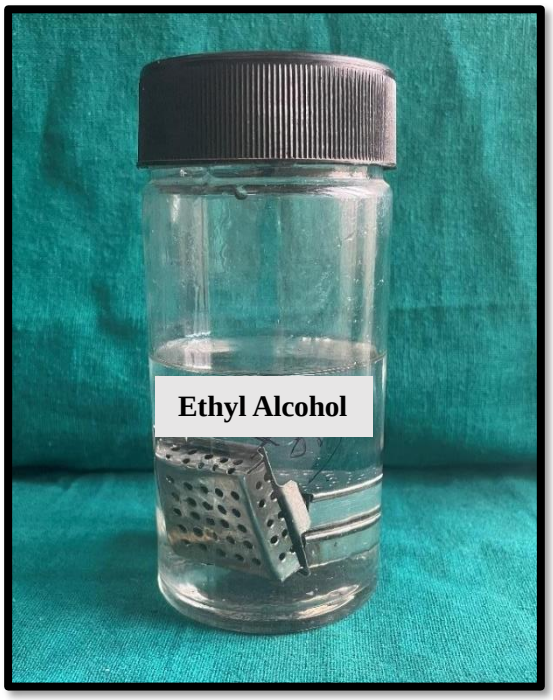


**Photograph 21-1 week post operative view after suture removal**


**Photograph 22- Collection of Non Absorbable, Natural, Multifilament Wax Coated Silk Suture.(Ethicon, Johnson and Johnson Waluj ,Aurangabad,India)$^{TMV06}$ in a10% Neutrally Buffered Formalin Solution**



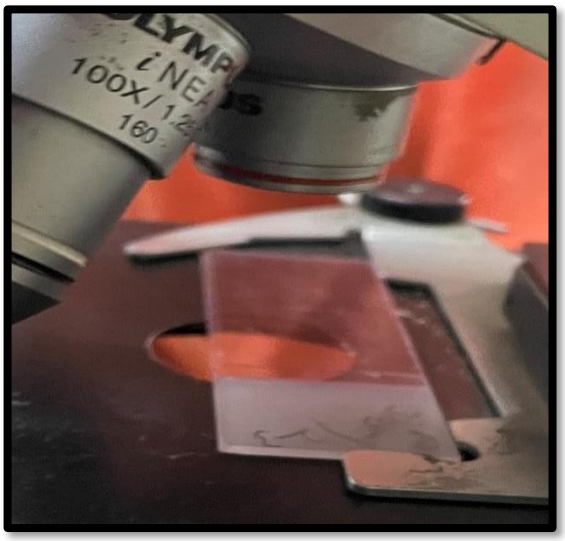

**Photograph 23- Collection of Non Absorbable,Synthetic,Monofilament Polypropylene Suture. .(Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)$^{TMVO4}$iin a10% Neutrally Buffered Formalin Solution**



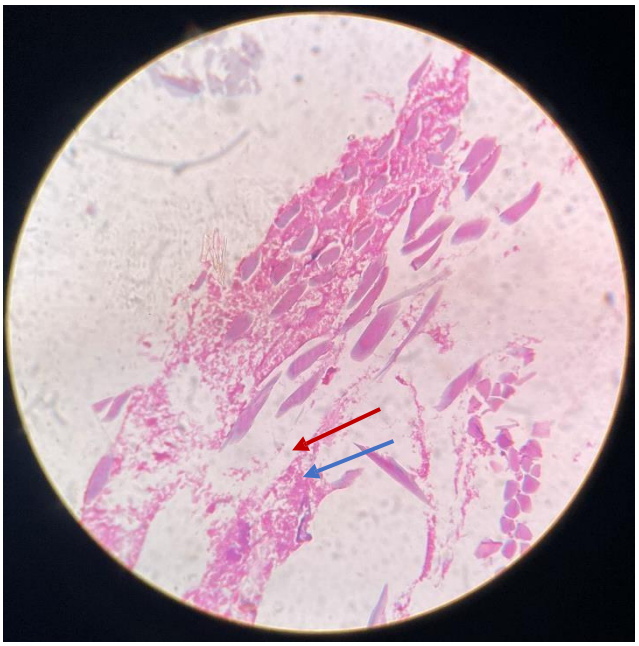

**Photograph 24-Fixation of Suture Material in Ethyl Alcohol Solution**

**Photograph 25- Suture Samples Embedded in Paraffin**

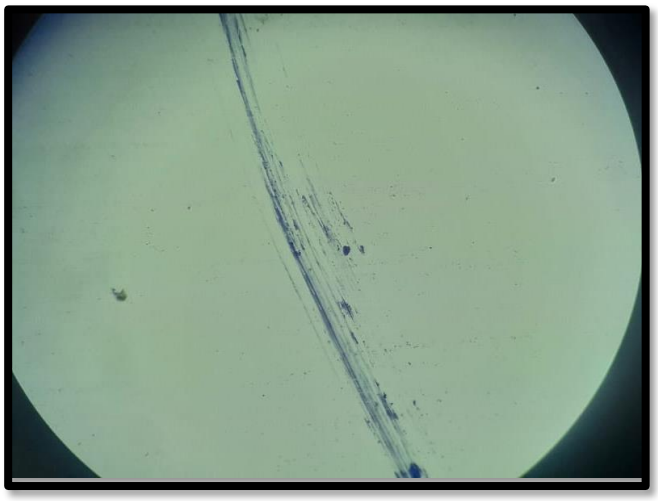
**Photograph 26-Microscope for Histological Analysis of Group I and Group II**



**Photograph 27-Microscopic examination of Suture Materials under 40x magnification**



**Photograph 28-Microscopic view of Non-Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon,Johnson and Johnson Waluj ,Aurangabad,India)$^{TMV06}$ under 40x magnification Blue arrow showing longitudinal section of Suture, Red arrow showing Inflammatory cells**



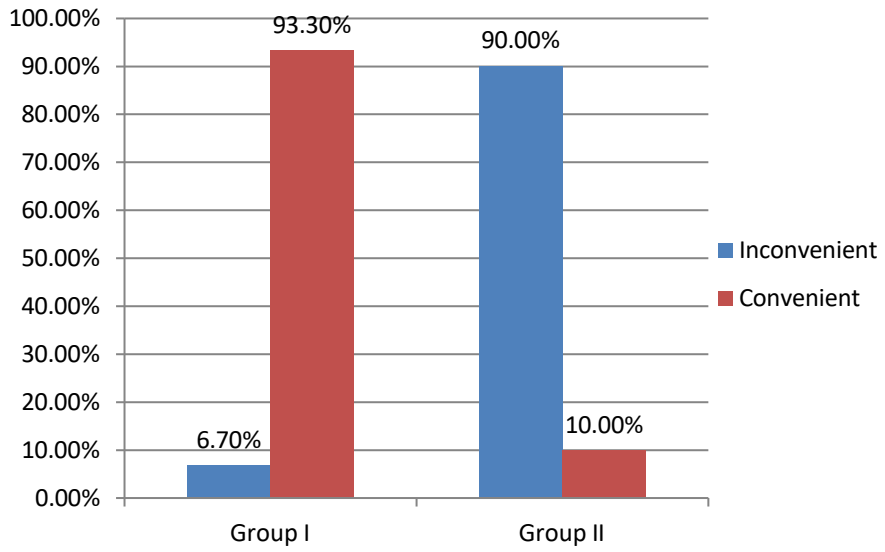
**Photograph 29-Microscopic view of Non Absorbable,Synthetic,Monofilament Polypropylene Suture. .(Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)$^{TMVO4}$ under 40x magnification Showing absence of inflammatory cells.**

## Intergroup Comparison of Operator Convenience Between The Groups

| | Inconvenient | Convenient | Chi Square value | P value |
|---|---|---|---|---|
| Group I | 2 | 28 | 41.173 | 0.001 (Sig) |
| | 6.7% | 93.3% | | |
| Group II | 27 | 3 | | |
| | 90.0% | 10.0% | | |

Chi Square test with p value <0.05 is significant

**Table-1 Intergroup Comparison of Operator Convenience Between Group-I Group-II**




**Graph-1 Depicts Operators Convenience In Both Groups**

The operator convenience was assessed on the basis of Self prepared Operators Clinical Handling Convenience Index. In Group I 93% of subjects reported convenience of use and 6.7 % of subjects reported inconvenience.

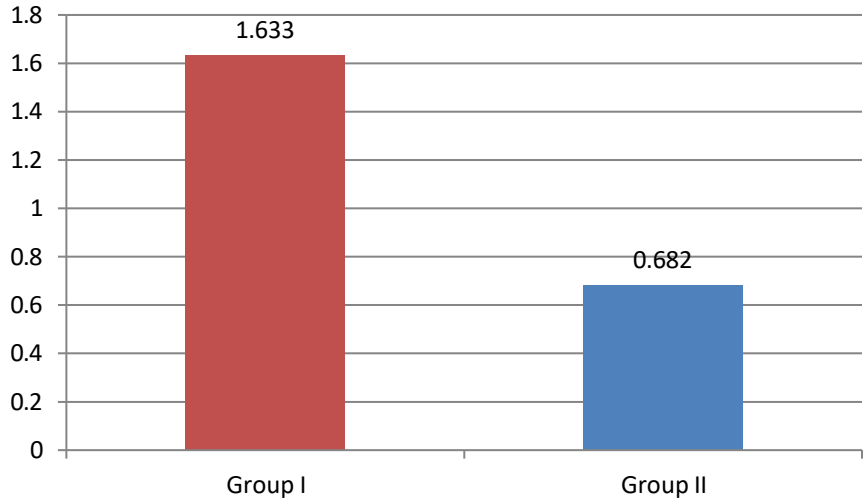
In Group II the operator convenience was 10 % and 90% subjects reported inconvenient. The intergroup comparison between two groups was statistically significant (p=0.001).

## Intergroup Comparison Of Gingival Index Between Groups

| | Mean | SD | Std Error | P value | Significance |
|---|---|---|---|---|---|
| Group I | 1.633 | 0.263 | 0.048 | 0.001 | Significant |
| Group II | 0.682 | 0.133 | 0.024 | | |

**Independent t test with p value <0.05 is significant**

**Table-2 Depicts Inter Group Comparison Of Gingival Index**




**Graph-2 Depicts Inter Group Comparision Of Gingival Index**

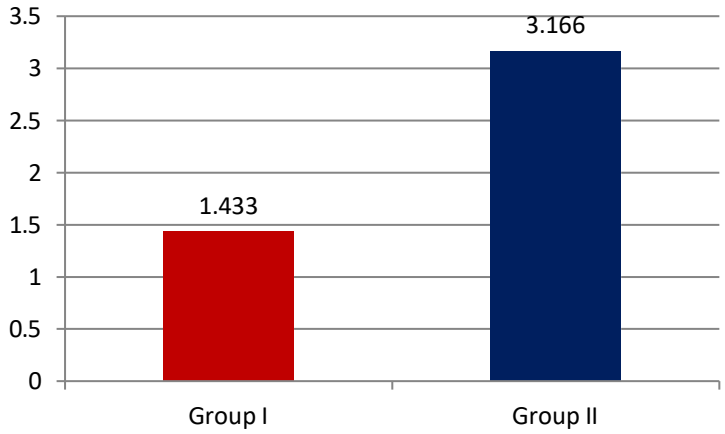
Table -1 showing The Gingival index was assessed on the basis of Loe and Silness index of 1963. The mean Gingival index score in the Group I was 1.633 (sd=0.262) and in the Group II was 0.682 (sd=0.133). The intergroup comparison between two groups was statistically significant. The mean score of 1.63 in the Group I indicates Moderate inflammation and in the Group II indicated Mild Inflammation .

**Intergroup Comparison Of Patient Comfort Score Between Groups**

| | Mean | SD | Std Error | P value | Significance |
|---|---|---|---|---|---|
| Group I | 1.433 | 0.626 | 0.114 | 0.001 | Significant |
| Group II | 3.166 | 0.647 | 0.118 | | |

Independent t test with p value <0.05 is significant

**Table-3 Depicts Intergroup Comparison of Patient Comfort**




**Graph-3 Depicts Intergroup Comparison of Patient Comfort**

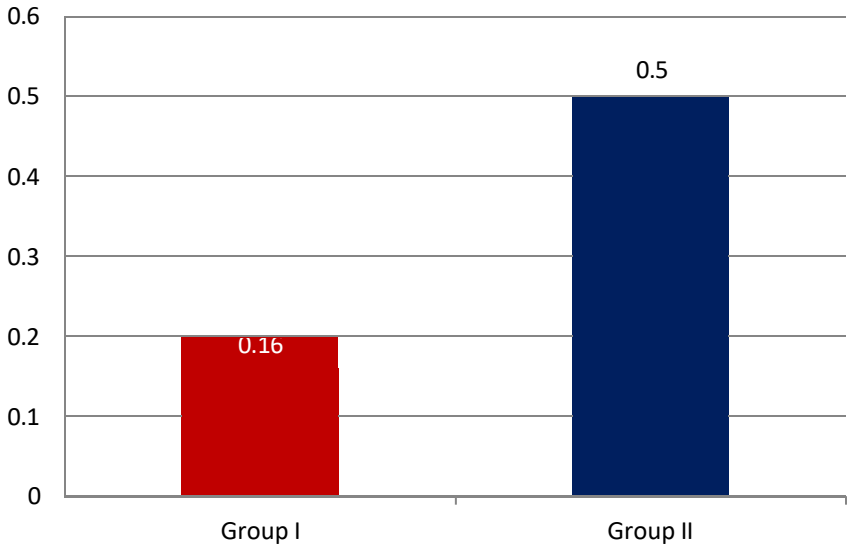
Table-3 showing The patient comfort score was calculated on the basis of Pain and Patient Comfort by Visual Analog Scale (Hayes and Patterson 1921). The mean patient comfort score in the Group I was 1.433 (sd=0.626) and in the Group II was 3.166 (sd=0.647)The intergroup comparison between two groups was statistically significant . which is showing that patient in Group II had more pan discomfort compared to Group I. Based on mean scores in the Group II subjects were in category of Nagging pain and in the Group I subjects were in category of mild pain.

## Intergroup Comparison Of Missing Sutures Between Groups

| | Mean | SD | Std Error | P value | Significance |
|---|---|---|---|---|---|
| Group I | 0.16 | 0.379 | 0.069 | 0.001 | Significant |
| Group II | 0.50 | 0.731 | 0.133 | | |

Independent t test with p value < 0.05 is significant

**Table- 4 Depicts Inter Group Comparison Of Missing Sutures Between Group I And Group II**




Graph-4 Depicts Inter Group Comparison Of Missing Sutures Between Group I And Group II

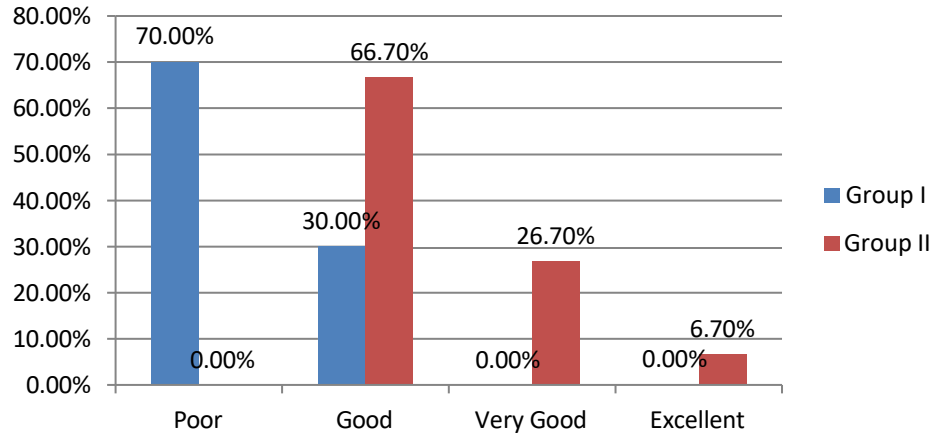
Table -4 showing that The mean Number of missing sutures score in the Group I was 0.16 (sd=0.379) and in the Group II was 0.50 (sd=0.731). No of Missing Suture was more in Group II. The intergroup comparison of missing suture between two groups was statistically significant .

**Intergroup Comparison Of Soft Tissue Healing Between The Groups**

| | Poor | Good | Very Good | Excellent | Chi Square value | P value |
|---|---|---|---|---|---|---|
| Group I | 21 | 9 | 0 | 0 | 351.73 | 0.001 (Sig) |
| | 70.0% | 30.0% | .0% | .0% | | |
| Group II | 0 | 20 | 8 | 2 | | |
| | .0% | 66.7% | 26.7% | 6.7% | | |

Chi Square test with p value less than 0.05 is significant

**Table-5 Showing Intergroup Comparison Of Soft Tissue Healing**




**Graph-5 Showing Intergroup Comparison Of Soft Tissue Healing**

The soft tissue healing was assessed on the basis of Soft Tissue Healing Index by Landry et al(1988).It was seen that Group I majority (70 %) of the subjects showed Poor healing of 30% showed Good healing response.In Group II 66.7% showed good Healing response ,26.7% showed very good response and 6.7% showed Excellent response.there wrew no subjects falling into Poor response.The intergroup comparison between two groups was statistically significant between two groups (p=0.001) .

The poor score indicates more than 50% of gingiva is red, with Bleeding and Granulation tissue Present and Incision margin not epithelialized, with

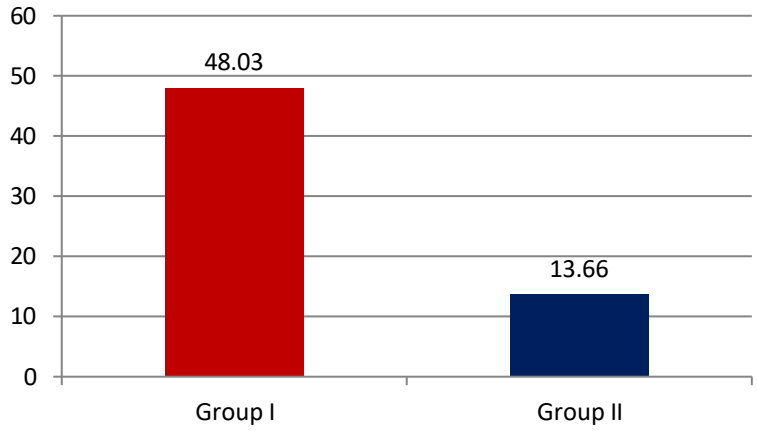
connective tissue exposed. The good score indicates 25% of gingiva is red, with no Bleeding and Granulation tissue absent and connective tissue non-exposed. The very good score indicated less than 25% of gingiva as red, with no Bleeding, Granulation tissue absent and connective tissue non- exposed. The excellent score indicated pink colored tissue with no bleeding, no granulation tissue and no exposed connective tissue

**Intergroup Comparison Of Number Of Inflammatory Cells Between Groups**

| | Mean | SD | Std Error | P value | Significance |
|---|---|---|---|---|---|
| Group I | 48.03 | 12.391 | 2.262 | 0.001 | Significant |
| Group II | 13.66 | 4.991 | 0.911 | | |

Independent t test with p value < 0.05 is significant

**Table -6 showing Intergroup Comparison Of Number Of Inflammatory Cells**




**Graph-6 Intergroup Comparison Of Number Of Inflammatory Cells**

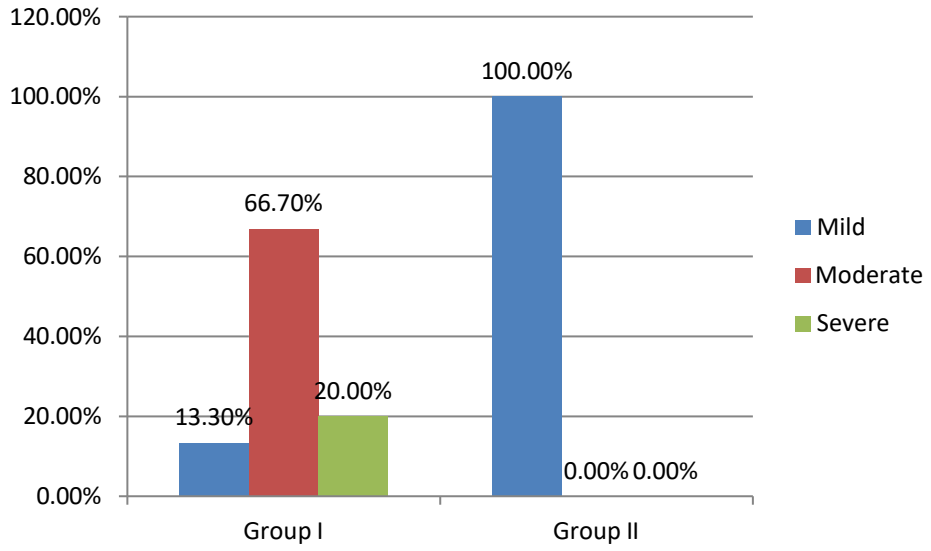
Table 6 showing that The mean Number of inflammatory cells score in the Group I was 48.03 (sd=12.391) and in the Group II was 13.66 (sd=4.991). No of inflammatory cells were found to be more in group I and the difference between the two group was found to be statistically significant.

## Intergroup Comparison Of Histological Analysis Between The Groups

| | Mild | Moderate | Severe | Chi Square value | P value |
|---|---|---|---|---|---|
| Group I | 4 | 20 | 6 | 45.081 | 0.001 (Sig) |
| | 13.3% | 66.7% | 20.0% | | |
| Group II | 30 | 0 | 0 | | |
| | 100.0% | .0% | .0% | | |

Chi Square test with p value less than 0.05 is significant

**Table -7 Intergroup Comparison Of Histological Analysis Between The Groups**




**Graph-7 Intergroup Comparison Of Histological Analysis Between The Groups**

Based on histological analysis, in the Group I 13.3% were having mild response, 66.7% were having moderate response and 20% were having severe response. In the Group II 100.0% were having mild response . The intergroup comparison between two groups was statistically significant(p=0.001) .

The mild histological reaction indicated less than 30 inflammatory cells, moderate histological reaction indicated 30-60 inflammatory cells and severe histological reaction indicated more than 60 inflammatory cells

A specific microorganism or group of specific microorganisms can cause periodontitis, which is described as "an inflammatory disease of the supporting tissues of the teeth, resulting in progressive destruction of the periodontal ligament and alveolar bone with increased probing depth formation, recession, or both."[31] The presence of clinically discernible attachment loss as a result of inflammatory destruction of the alveolar bone and periodontal ligament separates periodontitis from gingivitis. The formation of periodontal pockets and alterations in the height and density of the subjacent alveolar bone frequently accompany this loss.[32]

The management of disease-induced alterations in the periodontal tissues is continuously accomplished through periodontal surgical procedures. Periodontal pockets have been treated with a few different approaches[33]. The restoration of a healthy dentogingival unit after flap surgery for periodontal reattachment depends on the close postoperative adaptation of gingival connective tissue onto the prepared tooth surface and the maintenance of this adaptation for a while.[34]

Following surgical intervention, sutures are crucial to the healing of wounds because they facilitate the re-aproximation of tissues that have been damaged during surgery. For tissue flaps, the minimum coaptation period is roughly five days.[35] This makes sutures a regular part of wound care and the healing process, hence clinicians should have a thorough understanding of the appropriate suture or suture-like biomaterials for wound closure.[36]

Throughout the beginning of time, surgical sutures have been used to close wounds without difficulty. Even with advanced suture materials and techniques, there are times when the desired level of wound closure is not achieved. Complications include wound gaping, tearing, fistulation, granuloma formation, and delayed healing as a result of a lengthy surgical procedure are possible.

While sutures have not been examined as a significant factor influencing delayed infection in those studies, it was mentioned that sutures may have a role in the onset of postoperative infection when combined with other factors.

It has been revealed that the following factors could be used as independent predictors to explain 34% of the variability in microbial amount among patients: type of suture, suture slack (seventh day), ease of suture removal, and incidence of postoperative infection. Stated differently, selecting the right suture material helps lower the chance of infection.[37]

Previous experimental studies using a cat model have demonstrated that wounds with sutures removed after 7 days had significantly more collagen fibers than wounds with sutures removed after only 3 days.[38]

Following surgical intervention, sutures are crucial to the healing of wounds because they facilitate the re-aproximation of tissues that have been damaged during surgery.

The anatomical distinction of the oral cavity accounts for the variations in the susceptibility to infection that exist between oral wounds and those in other areas of the human body.[39] This makes it al the more important to isolate the surgical area and keep it sterile.

Suture threads should have the appropriate tensile strength for the intended application, tissue biocompatibility, ease of tying, minimal amount of knot slippage allowed.

Choosing the right suturing technique, thread type, thread diameter, surgical needle, and surgical knot for each chosen thread material are all crucial to achieving the best possible wound healing in periodontal plastic, cosmetic, and reconstructive procedures. This is particularly true and difficult when tissues are adapted over regenerative membranes, autologous or allograft material, and/or hard and/or soft tissue. Since in these situations the tensile strength of the suture materials would come into play more so. In addition, the success of every surgical procedure depends critically on the skill and art of suturing.[40]

Additionally, surgical threads can be made of synthetic or natural nonresorbable materials. Traditionally, silk has been the material most commonly used in surgery, including dentistry.[41] Silk ties with a slip knot, is inexpensive when compared to other nonabsorbable sutures that are

currently on the market, and is easy to work with and maintains knot integrity. This is the reason we used silk suture in our study. Silk, however, has certain drawbacks. Secondly, silk in particular is a multifilament that draws fluids and bacteria to the site of the wound.[42] Consequently, silk is not the preferred suture material when any sterile materials (such as dental implants, bone grafts, or regenerative barriers) are positioned beneath a mucoperiosteal flap or when therebis clinical evidence of an infection at the surgical.[43]

Apart from Silk, other nonabsorbable sutures that can be used in these situations, are nylon, polyester, polyethylene, polypropylene, or expanded polytetrafluoroethylene (e-PTFE).

Since polypropylene is mono filamentous, its tensile strength won't deteriorate with time. It has a low coefficient of friction, is inert, easily passes through tissue, and has strong knot security. The primary drawback of this suture material is tissue irritation caused by the suture material's cut ends.[44] In accordance with Lilly et al (1972), we found that polypropylene induced tissue reactions to a lesser degree than silk.[45]

Surgical threads are categorized according to thread diameter in addition to the material they are composed of. The diameter of thread materials varies from 1 to 10, with a higher number denoting a thinner, more delicate thread.7. In the context of periodontal plastic surgery, the majority of other periodontal mucoperiosteal flaps are secured with a 4-0 thread diameter, while soft tissue grafts and transpositional/sliding pedicle flaps are typically secured with a 5-0 thread.[46]

The suture thread's capillarity and three-dimensional configuration are its most crucial physical features because they have a direct impact on the suture's susceptibility to bacterial accumulation and the wicking phenomenon, which is the transfer of bacteria and oral fluids into the wound.[47] According to some study, the amount of microorganisms on monofilament sutures was significantly less than that on multifilament sutures.[48] The polypropylene suture had the lowest bacterial load. While there are few clinical studies examining the use of polypropylene sutures in the oral cavity,

comparable studies have demonstrated that PTFE and monofilament nylon sutures have a lower microbial population than silk sutures.[49]

Additionally, there are a number of disadvantages to these suture materials, including the ability to cut through debris, the permeability of the suture threads to oral fluids, and tissue reaction, all of which increase the risk of postoperative complications.[50]

Numerous scientific studies appear to be trying to replace the trend of silk sutures with something else. The development of Polypropylene suture as a surgical adhesive in dentistry creates a new foundation for tissue adhesives of the future. Benefits to using Polypropylene in clinical settings, such as reduced recovery times, the creation of protective barriers, and painless application.

According to Otten JE et al study the low microbial adherence on polypropylene suture is mainly due to its impeccably smooth surface. This is of great importance since it is known that bacterial load on the fibers increases the incidence of infection.[51,52]

Using of clinical and histological parameters, the effectiveness of silk and Polypropylene sutures compared in this clinical study. 30 patients were chosen at random for our study and placed in either of two groups:

Group I underwent Periodontal flap surgery and was then approximated by Non Absorbable, Natural, Multifilament Wax Coated Silk Suture. (Ethicon Johnson and Johnson Waluj ,Aurangabad,India)[TMV06]

Group II underwent the Periodontal flap surgery and flap approximated by using Non Absorbable Synthetic, Monofilament Polypropylene Suture. (Ethicon,Johnson and Johnson,Waluj ,Aurangabad,India)[TMVO4]

All of the clinical parameters improved statistically significantly from baseline to seven days when compared within groups. Following parameters produced the following results.

The operator convenience was assessed on the basis of Self prepared Operators, Clinical Handling Convenience Index. In Group I 93% of

subjects reported convenience of use and 6.7 % of subjects reported inconvenience. In Group II the operator convenience was 10 % and 90% subjects reported inconvenient. The intergroup comparison between two groups was statistically significant (p=0.001). Miroslav Dragovic 2019 & Marko Pejovic 2019 Suggested that Polypropylene is more convenient to handle as compare to silk suture.[53]

The Gingival index was assessed on the basis of Loe and Silness index of 1963 one week postoperatively . The mean Gingival index score in the Group I was 1.633 (sd=0.262) and in the Group II was 0.682 (sd=0.133). The intergroup comparison between two groups was statistically significant. The mean score of 1.63 in the Group I indicates Moderate inflammation and in the Group II indicated Mild Inflammation. That means to say that Group II had less inflammatory component. When compared to the sites, the sites closed with silk sutures required a longer healing period and more dense inflammation, as suggested by Joshi et al. (2011)[54] Vaaka PH et al. (2018)[55]

The patient comfort score was calculated on the basis of Pain and Patient Comfort by Visual Analog Scale (Hayes and Patterson 1921). The mean patient comfort score in the Group I was 1.433 (sd=0.626) and in the Group II was 3.166 (sd=0.647). The intergroup comparison between two groups was statistically significant. Based on mean scores in the Group II subjects were in category of Nagging uncomfortable pain and in the Group I subjects were in category of mild annoying pain.

In this study, a statistically significant decrease in patient pain and discomfort was noted in the Group I when measured on a VAS scale. Besides that according to some studies Khalil HS (2009),[56] Elosua et al (2001)[57]. patient pain and discomfort was noted in case of silk suture rather than polypropylene which coinsides with our study.

According to T. R. Grigg et al. (2004)[58], the decreased postoperative pain was also caused by the absence of seepage (wicking effect) which is contradicting the result of our study.

In the present study patients were uncomfortable in case of polypropylene suture due to the knot which was continuously irritating the vestibules of area of concern.

Number of sutures were counted at the time of suture removal one week postoperatively. And the mean Number of missing sutures score in the Group I was 0.16 (sd=0.379) and in the Group II was 0.50 (sd=0.731). This interpretated in our study that the No. of missing suture was more in group II The intergroup comparison between two groups was statistically significant. (p=0.001). Dragovic 2019 et al stated that polypropylene showing more knot security rather than silk.which does not coinsides with our study.[53]

According to Silverstein at al 2005 the integrity of the entire surgical site to be jeopardized if just one knot or loop breaks, author also stated that the security of knot is also depends on the clinician control during the placement of suture and type of knot we are placing.[46]

The soft tissue healing was assessed on the basis of Healing Index by Landry et al (1988)[59]. The number of subjects with excellent soft tissue healing was 6.7% with very good soft tissue healing was 26.7% and with good soft tissue healing was 66.7% in the Group II. The number of subjects with good soft tissue healing was 30% with poor soft tissue healing was 70% in the Group I . The intergroup comparison between two groups was statistically significant (p=0.001)

The poor score indicates more than 50% of gingiva is red, with Bleeding and Granulation tissue present and Incision margin not epithelialized, with connective tissue exposed. The good score indicates 25% of gingiva is red, with no Bleeding and Granulation tissue absent and connective tissue non-exposed. The very good score indicated less than 25% of gingiva as red, with no Bleeding, Granulation tissue absent and connective tissue non-exposed. The excellent score indicated pink colored tissue with no bleeding, no granulation tissue and no exposed connective tissue [59] .

Tavelli L et al (2019) suggested that using silk suture results into poor and delayed wound healing.[60]

According to Abi Rached et al 1992 it is likely that the absence of capillarity and wicking effect, along with minimal tissue damage, are the primary causes of the best soft tissue healing observed in our study around polypropylene sutures. Conversely, the area surrounding the Silk suture showed the least amount of tissue regeneration, which was likely caused by the material's rough surface and strong antigenic properties. These results are consistent with some earlier research .[61]

Our findings indicate that using synthetic monofilament Polypropylene sutures after Periodontal surgery procedures is strongly preferred. Furthermore, the authors believe that it is always preferable to leave sutures in place for seven days and not remove them earlier.

There are literatures indicates that the degree of inflammation brought on by sterile suture roughly correlates with the suture material's capacity to cause infection [62].

In our present study based on histological analysis The mean Number of inflammatory cells score in the Group I was 48.03 (sd=12.391) and in the Group II was 13.66 (sd=4.991). The intergroup comparison was statistically significant. And on the basis of inflammatory cells in the Group I 13.3% subjects were having mild response, 66.7% were having moderate response and 20% were having severe response, in the Group II 100.0% were having mild response. The intergroup comparison between two groups was statistically significant (p=0.001).

The mild histological reaction indicated less than 30 inflammatory cells, moderate histological reaction indicated 30-60 inflammatory cells and severe histological reaction indicated more than 60 inflammatory cells.[53] According to Dragovic et al Increased inflammatory response will worsen the pain associated with suture removal, but it will also make the process more difficult. Therefore, it should be considered that Polypropylene sutures are easier to remove than others because they cause less inflammatory reaction. Probably, the main reason for that is peri-sutural tissue ingrowth. Other authors reported that greater peri-sutural tissue ingrowth is found in multifilament sutures.[63,64]

G.Elily et al, N Yilmaz et al 2010 stated that oral tissue responds to sutures has shown that there are persistent inflammatory reactions, which are minimal with nylon, polyester, ePTFE, polyglecaprone 25, and PGA and more noticeable with silk and cotton [3, 5,].[64]A histological study examined how different suture materials affected the responses of oral tissue. The findings demonstrated that there were many neutrophilic polymorphonuclear leukocytes in the vicinity of silk sutures, whereas the intensity of these leukocytes was lower in oral tissues that were farther away from the silk sutures.[65]

This is consistent with the findings of other writers and suggests that the physical arrangement of the threads, not their chemical makeup, influences the inflammatory response.[66,67]

From the perspective of the surgeon, the most crucial factor determining the clinical usefulness of suture material is its ease of handling during surgery. It is widely acknowledged that surgeons experience ease of intraoperative handling when performing the tying procedure. The polypropylene suture ( performed better in our study than the alternative sutures in case of soft tissue healing and also showing less or absence of inflammatory cells which means having mild inflammatory response and mprimarily due to its minimal tissue drag, and resistance to blood and saliva .[68,69]

The literature has reported that the rate of elongation for polyglactin and multifilament silk sutures is approximately 10-15%, whereas the rate is approximately 20–25% for monofilament polypropylene and poliglecaprone sutures. Consequently, it makes sense that postoperative edema and subsequent suture stretching would make multifilament sutures more susceptible to permanent alterations in the material structure. Our results are consistent with other research that found polypropylene to be the suture with the highest potential for tissue re-adaptation following reduction of swelling.[70]

Even though this was a randomized clinical study, it is possible that some data are not completely objective because surgeon preferences regarding all

clinical features of sutures could not be avoided. Furthermore, only half of the variability in soft tissue healing could be explained.

In our study we found that the silk sutures offered better clinical handling by the operator, more patient comfort and less number of missing sutures since the silk sutures are more pliable so working with them for beginner surgeons is favourable giving better results.

Polypropylene sutures had better G I score, better Healing mechanism and lesser inflammatory reactions. With boning of surgical skills, in due course of time mastering the art of using polypropylene sutures is also advisable keeping the benefits of these suture materials in mind.

A relatively small sample size could be the cause of some results that have not been obtained more frequently, or it could be the result of other factors that should be taken into account.

The development of suture materials has given dentists access to improved sutures made for particular surgical techniques. Because complex surgical procedures are performed on a daily basis, it is more important than ever to be knowledgeable about the different suturing arsenals that are available to help achieve the best possible wound closure. Thirteen Technique-sensitive procedures including dental implant therapy, mucogingival microsurgery, periodontal cosmetic plastic surgery, conventional periodontal therapy, regeneration of hard and/or soft tissue, and excisional treatment of pathologic tissue rely on the clinician's ability to suture properly for the best possible wound closure. New developments in suturing materials reduce the risk of postoperative infections while also removing some of the challenges that were previously present during surgical closure. Our study suggest that, whenever feasible, monofilament synthetic Polypropylene suture should be utilized to promote optimal soft tissue healing, lower the risk of infection following surgery, and ease suturing following Periodontal surgery.

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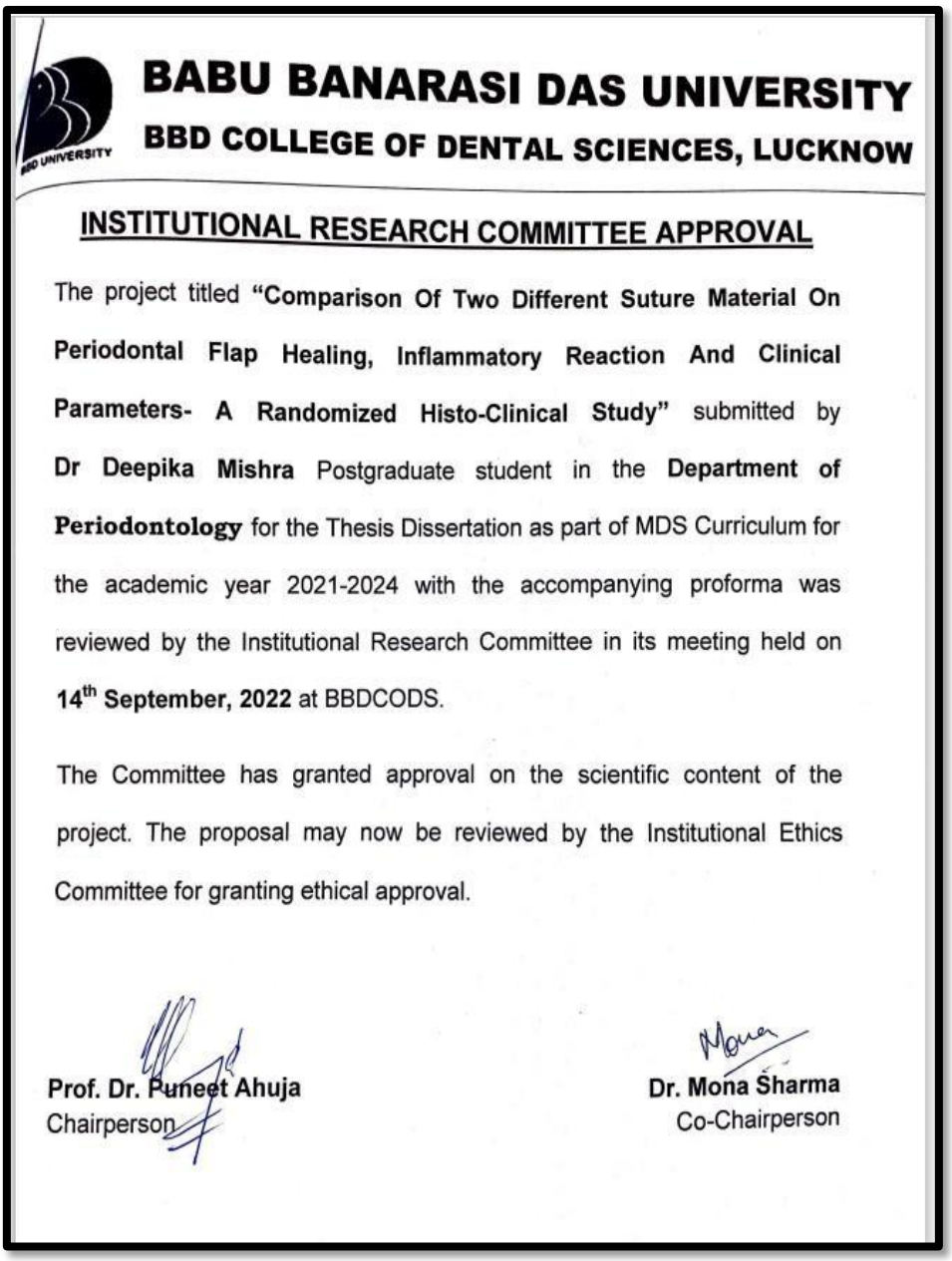
**ANNEXURE-1**



**BABU BANARASI DAS UNIVERSITY**

**BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW**

**INSTITUTIONAL RESEARCH COMMITTEE APPROVAL**

The project titled **"Comparison Of Two Different Suture Material On Periodontal Flap Healing, Inflammatory Reaction And Clinical Parameters- A Randomized Histo-Clinical Study"** submitted by **Dr Deepika Mishra** Postgraduate student in the **Department of Periodontology** for the Thesis Dissertation as part of MDS Curriculum for the academic year 2021-2024 with the accompanying proforma was reviewed by the Institutional Research Committee in its meeting held on **14th September, 2022** at BBDCODS.

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

**Prof. Dr. Puneet Ahuja**
Chairperson

**Dr. Mona Sharma**
Co-Chairperson

ANNEXURE-2

# BABU BANARASI DAS UNIVERSITY
## BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW

**BBDCODS/IEC/09/2022** **Dated: 16th September, 2022**

**Communication of the Decision of the Xth Institutional Ethics Sub-Committee Meeting**

**IEC Code: 32**

**Title of the Project:** Comparison Of Two Different Suture Material On Periodontal Flap Healing, Inflammatory Reaction And Clinical Parameters - A Randomized Histo-Clinical Study.

**Principal Investigator:** Dr Deepika Mishra **Department:** Periodontology

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

**Type of Submission:** New, MDS Project Protocol

Dear Dr Deepika Mishra,

The Institutional Ethics Sub-Committee meeting comprising following members was held on 15th September, 2022.

| | | |
|---|---|---|
| 1. | Dr. Lakshmi Bala Member Secretary | Prof. and Head, Department of Biochemistry |
| 2. | Dr. Praveen Singh Samant Member | Prof. & Head, Department of Conservative Dentistry & Endodontics |
| 3. | Dr. Jiji George Member | Prof. & Head, Department of Oral Pathology & Microbilogy |
| 4. | Dr. Amrit Tandan Member | Professor, Department of Prosthodontics and Crown & Bridge |
| 5. | Dr. Rana Pratap Maurya Member | Reader, Department of Orthodontics & Dentofacial Orthopaedics |

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

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

Forwarded by:

Lakshmi Bala 16/09/22

**Prof. Dr. Puneet Ahuja**
Principal
BBD College of Dental Sciences
BBD University, Lucknow

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

**Dr. Lakshmi Bala**
Member-Secretary
Institutional Ethics Sub-Committee (IEC)
BBD College of Dental Sciences
BBD University, Lucknow

Member-Secretary
Institutional Ethic Committee
BBD College of Dental Sciences
BBD University

## ANNEXURES-3

**Babu Banarasi Das College of Dental Sciences**
**(Babu Banarasi Das University)**
**BBD City, Faizabad Road, Lucknow – 227105 (INDIA)**

**Consent Form (English)**

Title of the Study COMPARISON OF TWO DIFFERENT SUTURE MATERIAL ON PERIODONTAL FLAP HEALING , INFLAMMATORY REACTION, AND CLINICAL PARAMETERS – A RANDOMIZED HISTO- CLINICAL STUDY.

Study Number……..

Subject's Full Name…….

Date of Birth/Age ……

Address of the Subject…….

Phone no. and e-mail address……

Qualification ……

Occupation: Student / Self Employed / Service / Housewife/Other (Please tick as appropriate)

Annual income of the Subject……

Name and of the nominees(s) and his relation to the subject .....(For the purpose of
compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Document dated
……..for the above study and have had the opportunity to ask questions. **OR**
I have beenexplained the nature of the study by the Investigator and had the

opportunity to ask questions.

2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.
3. I understand that the sponsor of the project, others working on the Sponsor‘s behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided sucha use is only for scientific purpose(s).
5. I permit the use of stored sample (tooth/tissue/blood) for future research. **Yes [ ] No [ ]**
6. I agree to participate in the above study. I have been explained about the complications andside effects, if any, and have fully understood them. I have also read and understood the participant/volunteer’s Information document given to me.

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:……..

Signatory‘s Name……. Date …….

Signature of the Investigator…… Date……..

Study Investigator‘s Name..... Date……..

Signature of the witness…… Date……..

Name of the witness……

Received a signed copy of the PID and duly filled consent form

Signature/thumb impression of the subject or legally Acceptable representativ Date…

ANNEXURE-5

**Babu Banarasi Das College of Dental Sciences**

**(Babu Banarasi Das University)**

**BBD City, Faizabad Road, Lucknow – 227105 (INDIA)**

**Participant Information Document (PID)**

**1. Study Title**

Comparison of two different suture material on periodontal flap healing , inflammatory reaction, and clinical parameters – a randomized histo-clinical study.

**2. Invitation Paragraph**

You are being invited to take part in a research/trial study. Before you decide it is important for you to understand why the research/study is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your treating physician/family doctor if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

**3. What is the purpose of the study?**

The aim of the present study is to assess and compare the two commonly used suture material in periodontal flap surgery with respect to soft tissue healing, inflammatory reaction and clinical parameters at seventh day postoperatively.

**4. Why have I been chosen?**

You have been chosen for the study as you are fulfilling the required criteria

for the study.

**5. Do I have to take part?**

Your participation in the research is entirely voluntary. If you do, you will be given this information sheet to keep and will be asked to sign a consent form. During the study you are still free to withdraw at any time and without giving a reason.

**6. What will happen to me if I take part?**

You will be one of the 30 enrolled patients in the study and since it is a split mouth study; 60 quadrants in these 30 subjects according to age and gender matched, will be randomly divided into two groups . In Group I Periodontal flap surgery with non absorbable, natural, multifilament wax coated silk suture and in Group II Periodontal flap surgery with non absorbable, synthetic, monofilament polypropylene suture will be done.After that Clinical parameters , patients comfort will be assessed at seventh day post surgically. Histologic study will be performed, to assess inflammatory response of the tissue.

**7. What do I have to do?**

You do not have to change your regular lifestyles for the investigation of the study**.**

**8. What is the procedure that is being tested?**

30 patients will be selected on the basis of set inclusion and exclusion criteria. Since it is a split mouth study; 60 quadrants in these 30 subjects according to age and gender matched, will be randomly divided into two groups-

Group I - Periodontal flap surgery with non absorbable, natural, multifilament wax coated silk suture.

Group II - Periodontal flap surgery with non absorbable, synthetic, monofilament polypropylene suture.

Clinical parameters , patients comfort will be assessed at seventh day post surgically.

Histologic study will be performed, to assess inflammatory response of the

tissue.

**9. What are the interventions for the study? ;**

60 quadrants of 30 subjects according to ag and gender matched, will be randomly divided into two groups . In Group I Periodontal flap surgery with nonabsorbable, natural, multifilament wax coated silk sutureand and in Group II Periodontal flap surgery with non absorbable, synthetic, monofilament polypropylene suture will be done.After that Clinical parameters , patients comfort will be assessed at seventh day post surgically. Histologic study will be performed, to assess inflammatory response of the tissue.

**10. What are the side effects of taking part?**

There are no side effects on patients of this study.

**11. What are the possible disadvantages and risks of taking part?**

There are no risk or disadvantages of taking part in this study.

**12. What are the possible benefits of taking part?**

This study will help in Comparison of two different suture material on periodontal flap healing, inflammatory reaction, and clinical parameters.

**13. What if new information becomes available?**

Sometimes during a research project,new information becomes available about the research being studied. If this happens, your researcher will tell you about it and discuss with you whether you want to continue in the study. If you decide to withdraw, your researcher/investigator will make arrangements for your withdrawal. If you decide to continue in the study, you may be asked to sign an updated consent form.

**14. What happens when the research study stops?**

If the study finishes/stops before the stipulated time, this should be explained to

the patient/volunteer.

**15. What if something goes wrong?**

If any severe adverse event occurs, or something goes wrong during the study, the complaints will be handled by the doctors expertising in the field at BBDCODS opd.

**16. Will my taking part in this study be kept confidential?**

Yes, it will be kept confidential. Your name, address or any other personal information will not be shared outside the BBDCODS.

**17. What will happen to the results of the research study?**

The results of the study will be used to evaluate and compare efficacy of the 4 different types of mouthwashes. Identity of the participants will not be disclosed in any result/ reports/ publications.

**18. Who is organizing the research?**

This research study is organized by the academic institute (BBDCODS)

**19. Will there results of the study be made available after study is over?**

Yes. If the patient wishes, the result of the study will be made available to him/her.

**20. Who has reviewed the study?**

The study has been reviewed and approved by the Head of the Department, IEC/IRC of the institution.

**21. Contact for furtherinformation**

Dr. Deepika Mishra

Department of Periodontology and Implantology

Babu Banarasi Das College of Dental Sciences.

Lucknow – 226028

Mob: 9670133041

Dr. Laxmi Bala,

Secretary and Member-Institutional Ethics Sub-committee

Babu Banarasi Das College of Dental Sciences.

Lucknow – 226028

bbdcods.iec@gmail.com

Signature of PI……

Name……..

Date……

**ANNEXURE-6**

**Babu Banarasi Das College of Dental Sciences**

**(Babu Banarasi Das University)**

**BBD City, Faizabad Road, Lucknow – 227105 (INDIA)**

**Guidelines for Devising a Participant / Legally Acceptable Representative Information Document (PID) in Hindi**

**1. अध्ययन शीर्षक**

पीरियोडॉन्टल फ्लैप हीललिंग, इिफ्लेमेटिी रिएक्शन औि क्लिलनकल मापदिंडोिं पि दो अलग-अलग लिवनी िामग्री की तुलना - एक यादृक्लिक लहस्टो-क्लिलनकल अध्ययन।

**2. आमंत्रण पैराग्राफ**

आपको एक शोध अध्ययन में भाग लेने के ललए आमिंलित लकया जा िहा है। लनर्णय लेने िे पहले आपके ललए यह िमझना महत्वपूर्ण है लक शोध क्योिं लकया जा िहा है औि इिमें क्या शालमल होगा। कृ पया लनम्नललक्लित जानकाि ी को ध्यान िे पढ़ने के ललए िमय लनकालें औि यलद आप चाहें तो लमोिं, रिश्तेदाि ोिं औि अपने इलाज किने वाले लचलकत्सक/पारिवारिक लचलकत्सक के िाथ इि पि चचाण किं । हमि पूछें लक क्या कु छ एिा है जो स्पष्ट नहीिं है या यलद आप अलधक जानकाि ी चाहते हैं।

**3. अध्ययन का उद्देश्य क्या है?**

वतणमान अध्ययन का उद्दे श्य पीरियोडॉन्टल फ्लैप िजणिी में आमतौि पि इस्तेमाल की जाने वाली दो लिवनी िामग्री का आकलन औि तुलना किना है, जो लक िातवें लदन पोस्टऑपि लटव रूप िे निम ऊतक उपचाि, भड़काऊ प्रलतलिया औि नैदालनक

**4. मुझे क्ययं चुना गया है?**

आपको चुना जाता है क्ोिंलक आप अध्ययन केमानदिंडोिं को पूिा किते हैं

**5. क्या मुझे भाग लेना है?**

यह आपको तय किना है लक भाग लेना है या यलद आप भाग लेने का लनर्णय लेते नहीिं

हैं, तो आपको यह िूचना पिक िि ने के ललए लदया जाएगा औि िहमलत प्रपि पि हस्ताक्षि किने के ललए कहा जाएगा। यलद आप भाग लेने का लनर्णय लेते हैं, तब भी आप लकिी भी िमय औि लबना कोई काि् बताए वापि लेने केललए स्वतिंि हैं।

**6. यदि मैं भाग लेता हूँ तय मेरा क्या हयगा?**

आप अध्ययन में नामाि्ंलकत 30 िोलगयोिं में िे एक होिंगे औि चूिंलक यह एक लवभालजत मुिंह वाला अध्ययन है; इन 30 लवषयोिं में आयु औि ललिंग लमलान के अनुिाि 60 चतुथांशोिं को यादृक्लिक रूप ि िे दो िमूहोिं में लवभालजत लकया जाएगा। ग्रुप I में नॉन एब्जॉबेबल, नेचुिल, मल्टीलिलामेंट वैक्स कोटेड लिल्क लिवनी के िाथ पीरियोडॉन्टल फ्लैप िजणिी औि ग्रुप II में नॉन एब्जॉबेबल, लिंथेलटक, मोनोलिलामेंट पॉलीप्रोपाइलीन लिवनी के

िाथ पीरियोडॉन्टल फ्लैप िजणिी की जाएगी। उिके बाद क्लिलनकल पैिामीटि, िातवें लदन मीजोिं के आिाम का आकलन लकया जाएगा। शल्य लचलकत्सा के बाद पोस्ट किं । ऊतक की भड़काऊ प्रलतलिया का आकलन किने के

**7. मुझे क्या करना हयगा?**

कुछ अन्य एहलतयाती उपायोिं केिाथ आहाि िेवन में कुछ बदलाव लकए जाएिंगे, औि आपि इिका पालन किने की अपेक्षा की जाएगी।

**8. दकस प्रदिया का परीक्षण दकया जा रहा है?**

30 मीजोिं का चयन िेट इनिूजन औि एक्सिूजन िाइटेरिया के आधाि पि लकया

30 लवषयोिं में 60 चतुथाांशोिं को यादृक्छिक रूप िे दो िमूहोिं में लवभालजत लकया जाएगा- ग्रुप I- नॉन एब्जॉबेबल, नेचुिल, मल्टीलिलामेंट वैक्स कोटेड लिल्क लिवनी के िाथ पीरियोडॉन्टल फ्लैप िजणी।

ग्रुप II- नॉन एब्जॉबेबल, लिि ंथेलटक, मोनोलिलामेंट पॉलीप्रोपाइलीन लिवनी के िाथ पीरियोडॉन्टल फ्लैप िजणी।

नैदालनक मापदिंडोिं, िोलगयोिं के आिाम का आकलन शल्य लचलकत्सा के बाद िातवें लदन लकया जाएगा।

ऊतक की भड़काऊ प्रलतलिया का आकलन किने के ललए, लहस्टोलॉजजक अध्ययन लकया जाएगा।

**9. अध्ययन के दौरान क्या हस्तक्षेप हैं?**

इि अध्ययन के दौरान कोई हस्तक्षेप नहीिं है।

**10. भाग लेने के दुष्प्रभाव क्या हैं?**

इि अध्ययन में भाग लेने का कोई जोक्लिम या नुकिान नहीिं

**11. भाग लेने के संभावित नुकसान और जयखिम क्या हैं?**

• लकिी भी प्रर्ालीगत िोग के दौरान जो पीरियोडोिंटल उपचाि के परिर्ाम को प्रभालवत किते हैं।

• गभणवती औि स्तनपान किाने वाली मलहलाएिं।

• धूम्रपान किने वाले औि तिंबाकू चबाने वाले।

• एिं मीज लजन्होिंने लपछले 3 महीनोिं िे एिंटीबायोलटक दवाओं का इस्तेमाल लकया है।

• इस्तेमाल की जा िही िामग्री के ललए एक ज्ञात एलजी वाले लवषय।

**12. भाग लेने के संभावित लाभ क्या हैं?**

इि अध्ययन में भाग लेने िे आपको कम पिेशानी में बेहति उपचाि लवकल्प प्राप्त होगा। यह अध्ययन पीरियडोिंटल फ्लैप हीललिंग, इिफ्लेमेटिी रिएक्शन

मापदंडोंि पि दो अलग-अलग लिवनी िंामग्री की तुलना किने में मदद किगा।

**13. क्या हयगा यदि नई जानकारी उपलब्ध हय जाती है?**

कभी-कभी एक शोध परियोजना के दौिंान, अध्ययन लकए जा िहे शोध के बाि के में नई जानकाि ी उपलब्ध हो जाती है। यलद एिं होता है, तो आपको इिके बाि के में ि ूलचत लकया जाएगा औि अध्ययन में होने वाले परिवतणनोंि के बाि के में ि ूलचत लकया जाएगा। आप अध्ययन के बीच में हटने के ललए स्वतंि हैं। यलद आप अध्ययन जाि ी ि िने का लनर्णय लेते हैं, तो आपि एक अद्यतन िहमलत िंॉमण पि हस्ताक्षि किने के ललए कहा जा ि किता है।

**14. जब शयध अध्ययन बंि हय जाता है तय क्या हयता है?**

यलद अध्ययन लनधाणरित ि मय f ि े पहले ि माप्त / बिंद हो जाता है, तो इिका काि् ि ोलगयोंि को ि मझाया जाएगा।

**15. अगर कुछ गलत हय जाए तय क्या हयगा?**

बीबीडीि ीओडीए ओपीडी में क्षेि में लवशेषज्ञता ि िने वाले डॉक्टिोंि द्वाि ा स्वयंि ेवकोंि की दे ि भाल की जाएगी।

**16. क्या इस अध्ययन में मेरे भाग लेने कय गयपनीय रि जाएगा?**

आपका नाम, पता या कोई व्यक्लिगत या अन्य जानकाि ी बीबीडीि ीओडी के बाहि ि ाझा नहीिं की जाएगी।

**17. शयध अध्ययन के पररणामयं का क्या हयगा?**

लकि ी भी परिर्ाम/रिपोटण/प्रकाशन में प्रलतभालगयोंि की पहचान का ि ुलाि ा नहीिं लकया जाएगा।

**18. शयध का आययजन कौन कर रहा है?**

अध्ययन शोधकताण द्वाि◌ा आयोलजत लकया जाता है। बोन ग्राफ्ट का पू◌ि◌ा च◌िणमीज द्वाि◌ा लदया जाएगा।

**19. क्या अध्ययन समाप्त हयने के बाि◌ अध्ययन के पररणाम उपलब्ध कराए जाएं गे?**

यलद ि◌ोगी चाहे तो अध्ययन का परिर्◌ाम उि उपलब्ध किाया जाएगा।

**20. अध्ययन की समीक्षा दकसने की है?**

ि◌ि◌ंस्थान के एचओडी/आईआि◌ी/आईईसी ने अध्ययन की ि◌मीक्षा की औि उि मिंजूि◌ी दी

**21. अदधक जानकारी के दलए संपक्ष करें**

डॉ. दीलपका लमश्रा
पीरियोडोि◌ंटोलॉजी औि इम्प्ाि◌ंटोलॉजी
लवभाग बाबू बनाि◌ि◌ी दाि◌ कॉलेज ऑ
डेंटल ि◌ाइंि◌ेज। लिनऊ - 226028
मोबाइल निंबि: 9670133041
Deep761173@gmail.com

**डॉ. लक्ष्मी बाला**
ि◌ि◌ंस्था की आचाि◌ लिमलत के ि◌दस्य ि◌लचव,
पता: बाबू बनाि◌ि◌ी दाि◌ लवश्वलवद्यालय, ि◌ि◌जाबाद ि◌ोड, आलति लवहाि◌, लिनऊ, यूपी।
226028 ईमेल: bbdcods.iec@gmail.com

पिं. का नाम -

पता -

ईमेल -

टेलीिोन निंबि। -

पीआई के हस्ताक्षि .....

नाम.....

ताि◌ीि.....

प्रलतभागी को ि◌ूचना पि की एक प्रलत औि हस्ताक्षरित ि◌हमलत प्रपि लदया जाएगा। अध्ययन में भाग लेने केललए धन्यवाद।

**ANNEXURE-7**

**PATIENT PROFORMA**

Name :-

Age :-

Sex :-

Chief complain :-

Group -

Parameters To Be Assessed

1) Pre Operative

i) Gingival Index ( Loe and Silness gingival index in 1963.)

Score-

Interpretation-

2) At the time of Completion of Surgery-

i) Assessment of patient's post- operative comfort, through V A S Scale .

Score-

Interpretation-

ii) Operator Convenience-

Yes-

No-

Can't say-

3) One Weak Post OperatIve Assesment-

i) Soft Tissue Healing with the help of Healing Index(HI) by LANDRY et al:(1988)

Interpretation-

Very Poor

Poor

Good

Very

Excellent

ii) Number of sutures remaining-

iii) Histological Analysis-

NO inflammatory reaction-

MILD inflammatory reaction -

MODERATE inflammatory reaction -

STRONG inflammatory reaction-

## STATISTICAL ANALYSIS

The data for the present study was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 23.0 Version. The descriptive statistics included mean, standard deviation frequency and percentage. The level of the significance for the present study was fixed at 5%.

The intergroup comparison will be done using the independent t tests and ordinal variables were compared using Chi Square test The Shapiro–Wilk test was used to investigate the distribution of the data and Levene's test to explore the homogeneity of the variables.

### Mean

$$\overline{X} = \frac{\Sigma X}{N}$$

Where:

$\overline{X}$ = the data set mean

$\sum$ = the sum of

$X$ = the scores in the distribution

$N$ = the number of scores in the distribution

### Range

$$range = X_{highest} - X_{lowest}$$

Where:

$X_{highest}$ = largest score

$X_{lowest}$ = smallest score

**Variance**

$$SD^2 = \frac{\Sigma(X - \overline{X})^2}{N}$$

The simplified variance formula

$$SD^2 = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N}$$

Where:

$SD^2$ = the variance

$\sum$ = the sum of

$X$ = the obtained score

$\overline{X}$ = the mean score of the data

$N$ = the number of scores

**Standard Deviation (N)**

$$SD = \sqrt{\frac{\Sigma(X - \overline{X})^2}{N}}$$

The simplified standard deviation formula

$$SD = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N}}$$

Where:

SD = the standard deviation

$\sum$ = the sum of

$X$ = the obtained score

$\overline{X}$ = the mean score of the data

$N$ = the number of scores

**Independent t-test**

Independent t Test can be used to determine if two sets of data are significantly different from each other, and is most commonly applied when the test statistic would follow a normal distribution. The independent samples *t*-test is used when two separate sets of independent and identically distributed samples are obtained, one from each of the two populations being compared

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\left(\frac{(N_1 - 1)s_1^2 + (N_2 - 1)s_2^2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

Where X1 =Mean of the first Group, X2 =Mean of the Second Group

**Chi Square Test**

Chi-square is a statistical test commonly used to compare observed data with data we would expect to obtain according to a specific hypothesis. When an analyst attempts to fit a statistical model to observed data, he or she may wonder how well the model actually reflects the data. How "close" are the observed values to those which would be expected under the fitted model? One statistical test that addresses this issue is the chi-square goodness of fit test. This test is commonly used to test association of variables in two-way tables, where the assumed model of independence is evaluated against the observed data. In general, the ***chi-square test statistic*** is of the form

$$X^2 = \sum \frac{(\text{observed - expected})^2}{\text{expected}}$$

.

If the computed test statistic is large, then the observed and expected values are not close and the model is a poor fit to the data

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| Title | Comparison of two different suture material on periodontal flap healing, inflammatory reaction, and clinical parameters – A Randomized Histo-Clinical Study |
| Paper Submission ID | 1402264 |
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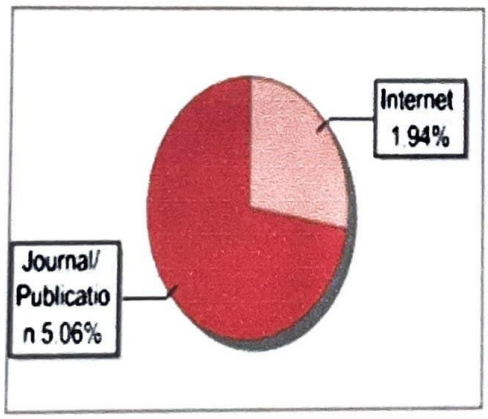


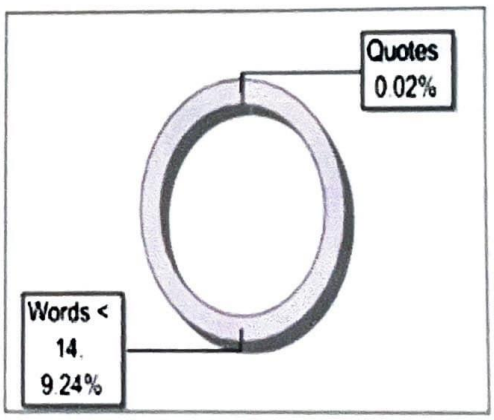


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