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Comparative Evaluation of Post-Operative Healing Using Commercially Available Fibrin Glue (Reliseal) and Black Silk Sutures (3-0) Following Periodontal Surgery: A Split Mouth Study.

1.Dr. Nilima. S. Rajhans, 2.Dr. Shruti Kishor kulkarni, 3.Dr. Nikesh N. Moolya, 4.Dr. Nilima Landge, 5.Dr. Asawari Lawande, 6.Dr. Shreyas Kishor Kulkarni

1.Dean and HOD, Department of Periodontology and oral Implantology, YCMM and RDF's Dental college and hospital, Ahilyanagar, Maharashtra, India

2.MDS Student, Department of Periodontology and oral implantology, Department of Periodontology and oral Implantology, YCMM and RDF's Dental college and hospital, Ahilyanagar, Maharashtra, India

3.Professor, Department of Periodontology and oral implantology, Department of Periodontology and oral Implantology, YCMM and RDF's Dental college and hospital, Ahilyanagar, Maharashtra, India

4.Professor, Department of Periodontology and oral implantology, Department of Periodontology and oral Implantology, YCMM and RDF's Dental college and hospital, Ahilyanagar, Maharashtra, India

5.Sr. Lecturer, Department of Periodontology and oral implantology, Department of Periodontology and oral Implantology, YCMM and RDF's Dental college and hospital, Ahilyanagar, Maharashtra, India

6.BDS

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ABSTRACT

Adequate tissue approximation is of utmost importance after periodontal surgery for favourable treatment outcomes. Conventionally, Surgical sutures were widely used for that purpose. Recently, tissue adhesives are introduced for flap approximation and to achieve hemostasis.

AIM- To evaluate and compare the post-operative healing using commercially availablefibrin glue (ReliSeal) and black silk sutures (3-0) following periodontal surgery.

MATERIAL AND METHODS: In a split-mouth study, 20 sites contralaterally in 10 patients having generalized stage II or III grade A periodontitis requiring periodontal flap surgery were randomly allocated in test(Reliseal fibrin sealant) and control sites(3-0 black silk sutures) and treated respectively. Patients were recalled on 2nd and 7th day for assessment of gingival index (GI), plaque index(PI), visual analogue score(VAS) and early wound healing index(EWHI).

RESULTS: The test group showed statistically significant improvement in GI, PI &VAS. However, difference in EWHI was insignificant.

CONCLUSION: Reliseal can be used as an alternative to black silk sutures for flap adaptation following periodontal surgery.

I. INTRODUCTION:

Periodontitis is a chronic inflammatory disease affecting the supporting structures of teeth causing tissue destruction and attachment loss often requiring surgical intervention to regain the lost attachment. Adequate tissue approximation is of utmost importance after periodontal surgery for favourable treatment outcomes. Conventionally, non-tension flaps following periodontal surgery were secured using sutures.[1] Wound closure is influenced by factors such as anatomic location (including adjacent soft and hard tissues and accessibility), wound surface area and depth (soft tissue thickness), and surgeon preferences (flap design, suture materials, and knot).[2]Successful surgery and the restoration of a healthy dento-gingival unit depend on the precise placement of the flap over the prepared root surface and its stable maintenance over an extended period.[3-5]A precise wound closure with approximation of wound edges is primarily achieved by conventional methods such as use of sutures.

Various materials like silk, nylon, catgut, polyglycolic acid and polyglactin have been used for the approximation of flaps[6]. However, Suturing can traumatize tissues during needle penetration and create a 'wicking' effect, allowing bacteria to reach underlying tissues. Consequently, the suture material itself may increase the risk of infection.[7-8] Suture granulomas, epithelial inclusion cysts, fistulas, and railroad track scars are disadvantages of sutures, despite improvements in suturing processes and materials.

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To overcome the probable disadvantages of sutures, a concept oftissue adhesives was put forward. Fibrin sealants, collagen-based sealants, synthetic polymer-based materials like cyanoacrylates, and protein-based sealants are introduced. ReliSeal is a fibrin glue consisting of fibrinogen concentrate, thrombin solution& aprotinin as fibrinolytic inhibitor. When mixed it mimics the final stage blood clotting process. It acts as hemostatic agent and tissue adhesive. So, it may work as a substitute to traditional suturing methods in periodontics.

The aim of this study is to compare and evaluate the use of commercially available fibrin glue (Reliseal®) as an alternative to 3-0 black silk sutures after periodontal flap surgery.

II. MATERIAL AND METHODS

The study was carried out in a department of periodontology in thedental college in maharashtra including 10 patients having generalized stage II or III grade A periodontitis requiring periodontal flap surgery. Patient consent was obtained before the treatment. Itwas split-mouth study involving 20 sites contralaterally in 10 patients who were randomly allocated in test (Reliseal fibrin sealant) and control sites (3-0 black silk sutures) and treated respectively. Patients were recalled on 2nd and 7th day for assessment of gingival index (GI)(Loe and Silness), plaque index (PI)(Silness& Loe), visual analogue score (VAS) and early wound healing index(EWHI).

Patients aged 20-55 yrs without any systemic illness were included in the study. Smokers, tobacco chewers, pregnant & lactating mothers were excluded.

The sample size was calculated using the mean and standard deviation (SD) of plaque scores for sutures and cyanoacrylate (1.57 ± 0.18 and 1.149 ± 0.26, respectively) observed in patients undergoing periodontal flap surgery, as reported by Kulkarni et al. With 80% power and 95% confidence, the minimum required sample size was determined to be 4.[9]

Before the flap surgery, the phase I therapy was carried out and evaluated. As it was a split mouth study, each quadrant of the patient requiring flap surgery was randomly allocated into test (Reliseal) and control (silk suture) site. On test sites (n = 6), the commercially available fibrin glue (Reliseal ®) was used to secure the flaps, and on control sites (n = 6), the black silk suture (3–0) was used to secure the flaps. Patients were recalled on 2nd and 7th day for follow up.

Surgical procedure

After administering adequate local anaesthesia, the flap surgery was carried out with full-thickness flaps. A thorough debridement was done and flaps were approximated by using the commercially available fibrin glue in test sites and silk sutures in control sites. The glue was prepared by mixing the contents as per the manufacturer's instructions and applied on inner side of the flaps to be approximated. The post-operative instructions were given to the patients and recalled on 2nd and 7th day to assess the clinical parameters. Plaque index (PI), gingival index (GI)were assessed on the 7th day. Wound healing index (WHI) and visual analogue scale (VAS) were assessed on the 2nd&7thpost-op days.

The obtained data was analyzed using SPSS software. The results for all categorical variables were expressed as a percentage. The Mann–Whitney U test was used to determine whether the median comparison of numerical variables between groups was statistically significant or not.

Group A- Reliseal application post op

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Group B- 3-0 silk sutures post-op

Table 1. Comparison of PI and GI on the 7th day between two groups

		n	Mean SD	Median	p value
PI on the 7th day	Group I	10	0.30 ± 0.500.00	(0.00–1.00)	
	Group II	10	1.45 ± 0.551.50	(1.00–2.00)	0.012
GI on 7th day	Group I	10	0.35 ± 0.52	0.00 (0.00–1.00)	
	Group II	10	1.05 ± 0.00	0.00 (0.0 0–1.00)	0.020

Table 2. Comparison of VAS on the 2nd& 7th day between two groups

		n	Mean SD	Median	p value
VAS on the 2nd day	Group I	10	1.60 ± 0.482.00	(1.00–2.00)	
	Group II	10	4.45 ± 0.524.50	(4.00–5.00)	0.002
VAS on 7th day	Group I	10	1.05 ± 0.60	1.00 (1.00–1.00)	
	Group II	10	2.80 ± 0.40	3.00 (3.00–3.00)	0.002

Table 3. Comparison of EWHI on the 2nd& 7th day between two groups

		n	Mean SD	Median	p value
EWHI on the 2nd day	Group I	10	1.20 ± 0.421.00	(1.00–1.00)	0.092
	Group II	10	1.75 ± 0.65	2.00 (1.00–2.00)	
EWHI on 7th day	Group I	10	1.00 ± 0.00	1.00 (1.00–1.00)	0.285
	Group II	10	1.10 ± 0.32	1.00 (1.00–1.00)	

Values are presented as mean ± standard deviation and median (Q1–Q3). Intergroup comparisons were made using the Mann–Whitney U test. $p < 0.05$ was considered statistically significant.

III. RESULTS

The study consisted of ten patients. A total of 20 sites were included in this randomized split-mouth trial. On the 2nd and 7th days, clinical parameters were evaluated. The EWHI and VAS were evaluated on the 2nd day. On the 7th day, PI, GI, EWHI, and VAS were evaluated.

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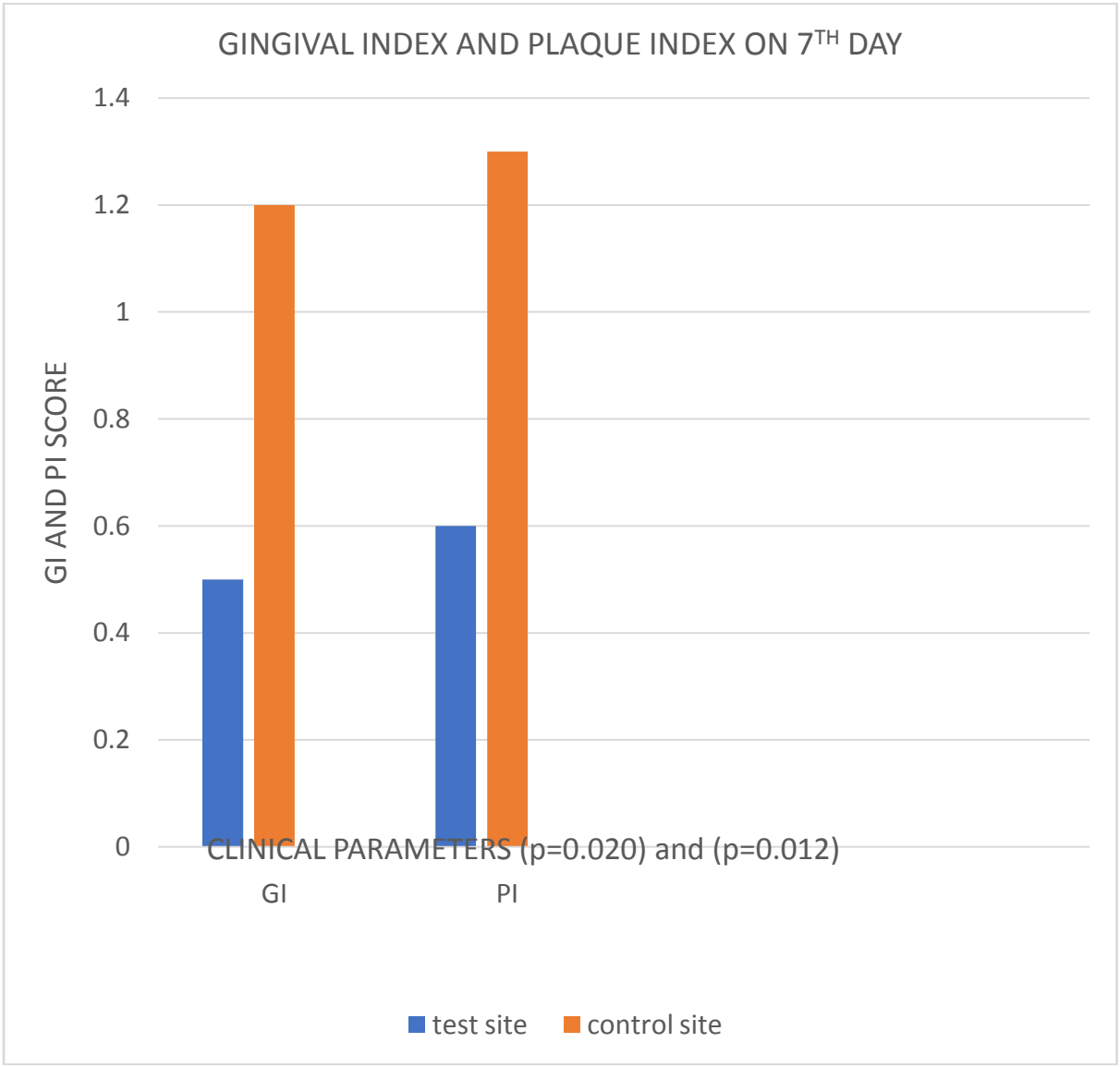
Table 1 shows the plaque index score and gingival index score evaluated on the 7th day between the two groups after surgery. In the test group, PI scores were 0.30 ± 0.50, whereas, in the control group, it was 1.45 ± 0.55, showing a statistically significant difference (p = 0.012). On the 7th day, comparing the GI between the groups, the mean GI score in the test group was 0.35 ± 0.52, and in the control group, it was 1.05 ± 0.00, which showed a statistically significant difference (p = 0.020).

Table 2 shows the comparison of VAS at different time points, which is on the 2nd and 7th day. The mean VAS score on 2nd day in the test group was 1.60 ± 0.48 and in the control group was 4.45 ± 0.52, the difference of which is statistically significant (p = 0.002). On 7th day of comparison, the mean VAS score was 1.05 ± 0.60 in the test group and in the control group which is 2.80 ± 0.40 which showed a statistically significant (p = 0.002).

Table 3 shows the comparison of EWHI at different time points, which is on the 2nd and 7th day. The mean EWHI score on 2nd day in the test group was 1.20 ± 0.42, and in the control group was 1.75 ± 0.65, the difference of which is not statistically significant (p = 0.092). On the 7th day, the mean EWHI score was 1.00 ± 0.00 in the test group, which is also not statistically significant (p = 0.285).



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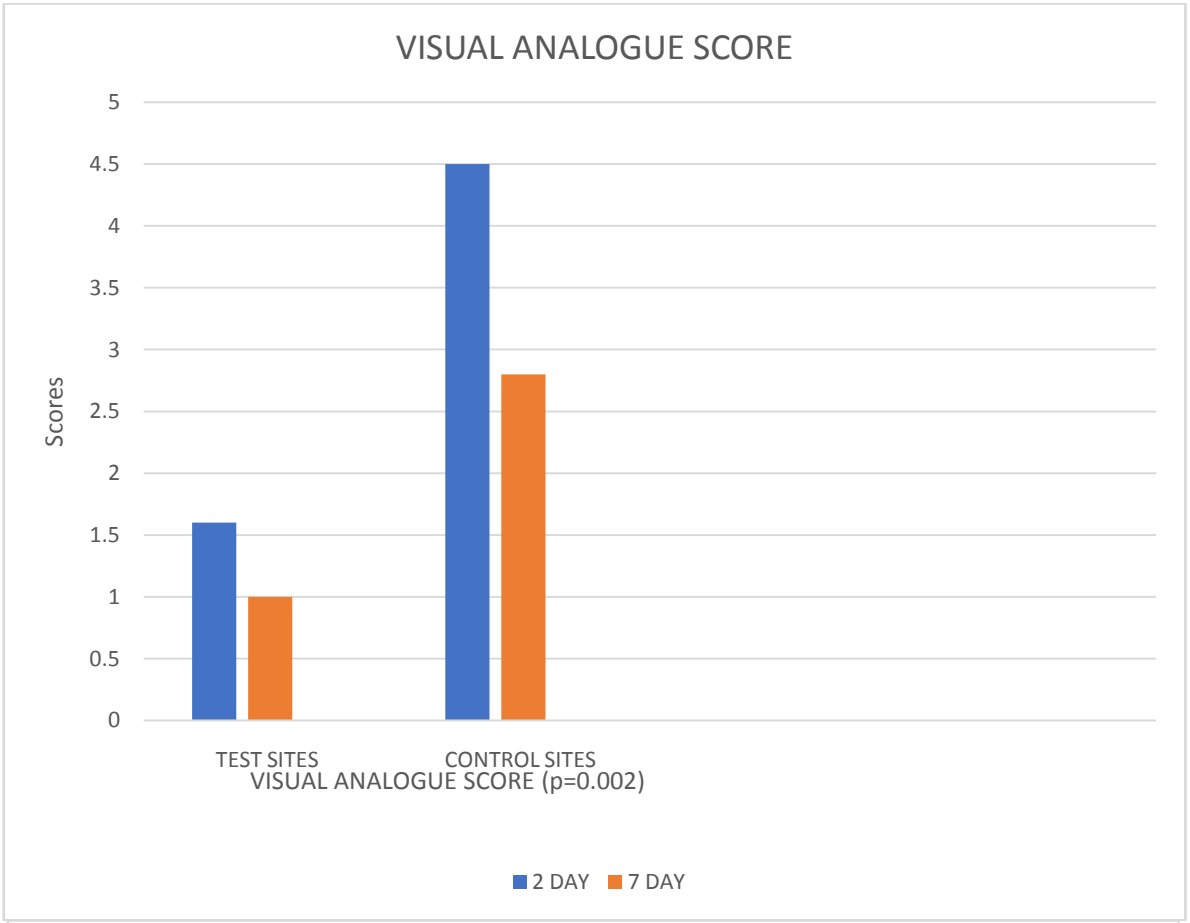

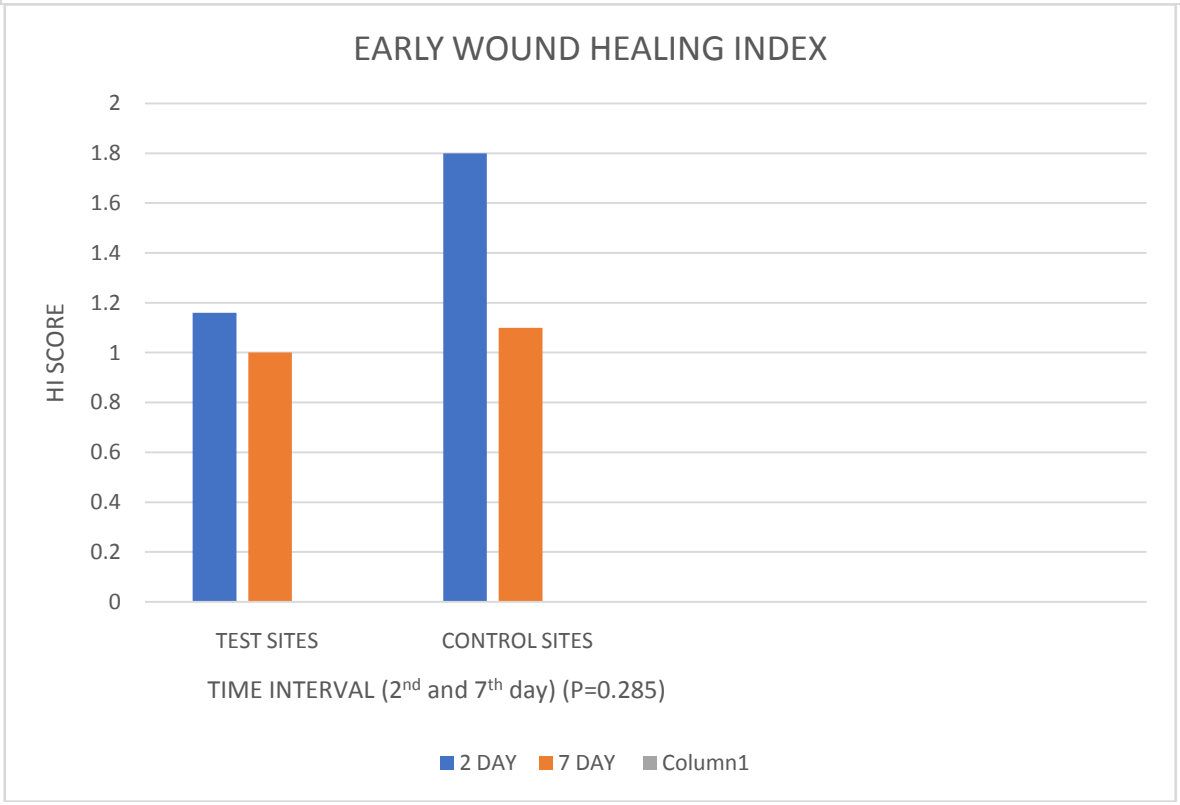

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IV. DISCUSSION

Healing following flap closure can be improved through proper wound isolation and precise approximation of the wound edges, which can be achieved by immobilizing the area with sutures or tissue adhesives.[10]

Silk sutures are more commonly used for wound closure than staples or adhesives due to their superior tensile strength, low dehiscence rate, and effective wound approximation. However, they have certain drawbacks, including the wicking effect, inadvertent needle trauma to healthy tissue, and tissue reactivity, which can contribute to postoperative complications. Additionally, suturing is time-consuming and may result in increased scar formation. These limitations highlight the need for alternative approaches, such as tissue adhesives, for periodontal flap closure.[11,12]The first tissue adhesive, methyl cyanoacrylate, was developed in 1958 and extensively studied for medical applications; however, it was ultimately abandoned due to its toxic effects.[13]

The present split-mouth study aimed to compare the efficacy of fibrin glue (ReliSeal) and traditional 3-0 black silk sutures in post-operative healing following periodontal flap surgery.

Fibrin glue is composed of thrombin and fibrinogen, which, when combined, replicate the final stage of the natural clotting process. The addition of aprotinin, a fibrinolysis inhibitor, slows down the breakdown of fibrin, allowing it to adhere to the tissue for a longer duration. Consequently, fibrin glue can serve as a safer and more effective option for promoting tissue repair and regeneration following periodontal surgery. Over the years, fibrin adhesive used as a suture substitute in periodontal surgery has been shown to increase fibroblast numbers during tissue regeneration. Additionally, fibrin glue has found applications across various medical and dental specialties.[14-16]

The primary goal of achieving tension-free flap closure following periodontal surgery is to ensure proper hemostasis and facilitate faster wound healing. Traditionally, sutures have been used for flap approximation; however, this method can be time-consuming, technique-sensitive, and increases the risk of accidental injury to the clinician. The use of tissue adhesives for flap closure addresses these drawbacks, offering a simpler and safer alternative to conventional suturing.[17]

The results demonstrated that the test group (fibrin glue) had significantly better outcomes in terms of gingival index (GI), plaque index (PI), and visual analogue scale (VAS) scores, while the early wound healing index (EWHI) showed no statistically significant difference.

A carefully planned surgery needs proper immobilization of the healing area and this can be achieved with appropriate material such as sutures or tissue adhesives.

Commercial fibrin glue is designed to replicate the body's natural clotting process. The formed clot adheres to the surrounding tissues, creating a scaffold that supports precursor and effector cells, along with hematopoietic growth factors, thereby promoting improved wound healing.[1]The application of fibrin glue resulted in quick hemostasis, enabling accurate flap positioning. In the regions treated with fibrin glue, no bleeding was noted after flap approximation. This biological adhesive, composed of natural physiological substances, seems to support the body's inherent clotting process, providing a clear benefit compared to traditional suturing.[16]

Results in this study showed significant improvement in plaque index, gingival index with ReliSeal as there is less plaque accumulation than with sutures and also reduced pain and discomfort resulted in improved VAS.

Nachimuthu K (2023)[18], Compared postoperative healing using Fibrin glue (Reliseal) and Vicryl Suture Following Periodontal Flap Surgery and found better results with fibrin sealant. The improved GI and PI scores in the fibrin glue group are consistent with several earlier studies. For instance,**Pini prato**(1987)[14] and **Pulikkotil et al** (2013)[19]reported significantly reduced inflammation and plaque accumulation at sites closed with fibrin glue compared to silk sutures following periodontal procedures. Fibrin sealants have shown superior soft tissue healing and minimal postoperative discomfort, attributing this to their smooth surface and lack of plaque-retentive properties. Silk sutures, although widely used due to their ease of handling and cost-effectiveness, are known to elicit more pronounced inflammatory responses and plaque accumulation. This has been well documented in studies like**Leknes et al(1992)[20] and Aberg et al(2005)[21]**, where silk was found to induce a higher degree of inflammatory cell infiltration compared to monofilament sutures or tissue adhesives.

The significantly lower VAS scores reported by patients in the fibrin glue group highlight one of its most notable advantages—enhanced patient comfort. The absence of needle puncture, reduced flap tension, and elimination of the need for suture removal likely contribute to this effect. These findings align with those of**Medeiros I(2024)[22] and Mounsif et al(2022)[23]**, who reported

better patient tolerance and reduced pain perception with fibrin glue in oral surgical procedures.

However, Contradictory findings have also been reported. Some found no significant difference in post-operative pain between sutures and fibrin glue in periodontal flap surgery. This discrepancy may be attributed to different adhesive brands, variations in surgical technique, or differences in subjective pain thresholds among study populations.

Although the EWHI scores in the fibrin glue group were slightly better, the difference was not statistically significant. This finding partially aligns with **Nachimuthu K(2023)**[18], who observed similar wound healing outcomes between suture and fibrin glue groups, suggesting that while fibrin glue may improve subjective parameters (pain, plaque control), the objective parameters of healing remain comparable in the short term. Similar results were also found in asplit-mouth randomized clinical trial by **Pulikkotil et al** (2013)[19]who compared fibrin sealant vs sutures in periodontal flap closure and reported improved healing at 7, 14 and 21 days in the sealant site.

A systematic review **Mounsif(2022)**[23]of fibrin sealant vs sutures in periodontal surgery concludedfindings of less inflammation/early healing in some studies.

One study by **Pulikkotil et al(2014)**[24]showed that fibrin sealants enhance early wound healing by lowering levels of IL-1β and IL-8, two key inflammatory mediators found in gingival crevicular fluid.

In another study by**Pulikkotilet al.(2013)**[19]**,**he observed that on the seventh day of follow-up, there was a statistically significant difference between the test side (fibrin sealant) and the control side (sutures) in clinical parameters such as plaque index, bleeding, tissue color, and soft tissue dehiscence. The control group exhibited greater plaque accumulation, gingival redness, and soft tissue dehiscence. Notably, the statistical comparisons between fibrin sealant and sutures were made for each follow-up day individually rather than across the overall follow-up period. Similarly, **Manimegalai et al(2010)**[25]. reported postoperative reductions in plaque and gingival index scores, as well as pocket depth, in the test groups compared to controls, although these differences were not statistically significant.

V. LIMITATIONS

The results from this study suggest that fibrin glue can be a viable alternative to conventional sutures for flap approximation, offering several benefits such as reduced inflammation, better plaque control, and increased patient satisfaction. However, limitations such as small sample size, short follow-up period, and lack of histological evaluation must be considered.

Long-term studies with larger sample sizes, different adhesive formulations, and histological confirmation of tissue healing are needed to further validate these findings. Additionally, cost-effectiveness and ease of use in routine clinical practice should also be explored in future research.

VI. CONCLUSION:

Regarding patient compliance, all patients showed greater acceptance of commercially available fibrin glue, largely due to its ease of application, which shortens operating time compared to silk sutures. The use of fibrin glue caused no secondary trauma, resulting in reduced postoperative pain and discomfort at treated sites.
The results of this preliminary study indicate that, when the flap edges are properly adapted and a saliva-free field is ensured, commercially available fibrin glue is a safe, quick, painless, and straightforward option for closing uninfected, tension-free periodontal flaps. Given these advantages, fibrin glue can serve as an effective alternative to silk sutures for flap closure following periodontal surgery.Reliseal can be used as an alternative to black silk sutures for flap adaptation following periodontal surgery.

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