



Comparative Assessment of Postoperative Healing Following Periodontal Flap Surgery Utilizing Isoamyl-2-Cyanoacrylate and Silk Sutures

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ABSTRACT:

Tissue adhesives have been developed to overcome these problems such as cyanoacrylate. This study aims to compare healing after periodontal flap surgery using isoamyl 2-cyanoacrylate and silk sutures at the end of 2 weeks, 1 month and 3rd month with parameters such as plaque index, bleeding index, modified gingival index and periodontal probing depth. Early inflammatory reaction was seen with cyanoacrylate during the 2nd week when compared with sutures. However, significant difference in healing was seen at 3 months when both the materials were compared and concluded that cyanoacrylate aids in early initial healing.

1. Introduction:

The diagnosis of periodontitis reduces the risk of acquiring or worsening other chronic systemic conditions by influencing the natural course, duration and outcome [1,2]. Periodontal pathogens employ the inflammatory process to enrich their environment by creating the etiologic biofilm [3]. Niklaus P. Lang et al. (2015) [4] mentioned that mechanical disruption of the biofilm is the standard of care procedure in managing

periodontal diseases. Periodontal flap surgery is the basic requirement of several periodontal procedures. After periodontal flap surgery, maintaining the flap margin in the appropriate position following debridement is a critical component that affects the surgical outcome's success. Which also depends primarily on early formation and organization of the blood clot that is resistant to mechanical forces acting on the flap. Inflammatory cells, keratinocytes, fibroblasts, and



endothelial cells work in concert to repair wounds in response to a variety of intricate signals. **Kulkarni S. et al. (2007)** [5] mentioned that materials like silk, nylon, catgut and polyglycolic-polylactic acid derivatives are being used for the post-operative closure of the flaps. Tissue adhesives have long been a topic of therapeutic attention as a potential suture substitute for wound closure. N-butyl-2-cyanoacrylate has a wide range of applications in health-related settings which fulfills most of the properties required for its use as tissue adhesive material [6]. It offers quick, painless wound closure. This study examined how well silk sutures and Isoamyl 2-cyanoacrylates promote wound healing during periodontal flap surgery while reducing post-treatment pain.

2. Materials and Methods:

In total, 20 patients (14 males and 6 females) were reported to the Department of Periodontology, Daswani Dental College and Research Centre, Kota, Rajasthan with moderate to severe periodontitis assessed by clinical criteria (probing depth $\geq 5\text{mm}$) was selected for study with informed consent. Patient who are medically healthy within 20-60 years of age with moderate to severe periodontitis were selected. Patient who had uncontrolled systemic conditions and mentally challenged were excluded from the study. After 1 week post-completion of phase 1 therapy baseline measurements were taken. The conventional non-displaced muco-periosteal flap surgery was done. After

hemostasis is achieved, the surgical area to be treated was randomly selected into two areas. The flap was sutured with silk suture using interrupted/Figure of eight suturing technique on one side (Group A Control) and Isoamyl-2-cyanoacrylate (Group B Test) on other side. Post-surgical instructions were given. Sutures were removed after 1 week and subjects were recalled for checkup at 2 weeks, 1 month and 3rd month post-operatively and clinical parameters such as plaque index, bleeding index and modified gingival index were recorded in each visit.

3. Results:

The mean value of Plaque index, Gingival index and Bleeding index in Group A and Group B was almost similar at baseline. At 2 week – An improvement in plaque index was relatively good in test group (0.89 ± 0.5) than control group (1.08 ± 0.4), modified gingival index improvement was relatively good in control group (1.52 ± 0.4) than test group (1.60 ± 0.4) and improvement in sulcus bleeding index was relatively good in test group (1.65 ± 0.4) than control group (1.91 ± 0.8). At 1 month, Improvement in plaque index in test (0.71 ± 0.6) than control (0.79 ± 0.2) group and modified gingival index improvement in test (0.89 ± 0.5) than control (1.02 ± 0.3) group and improvement in sulcus bleeding index in test (1.54 ± 0.7) than control (1.68 ± 0.5) group as compared to 2 week was evident. At 3 month, similar improvement in plaque index, modified gingival index and sulcus bleeding index of 3 month as compared to 1 month is evident in both groups.

4. Figures and Tables:

4.1 Figures

Figure 1: Baseline



Figure 2: Incision





Figure 3: Elevation and Debridement



Figure 4: Isoamyl 2-Cyanoacrylate (Amcrylate)



Figure 5: Suture Placement



Figure 6: Cyanoacrylate Placement



Figure 7: Two Weeks Postop Image



Figure 8: One month Postop Image



Figure 9: Three Month Postop Image



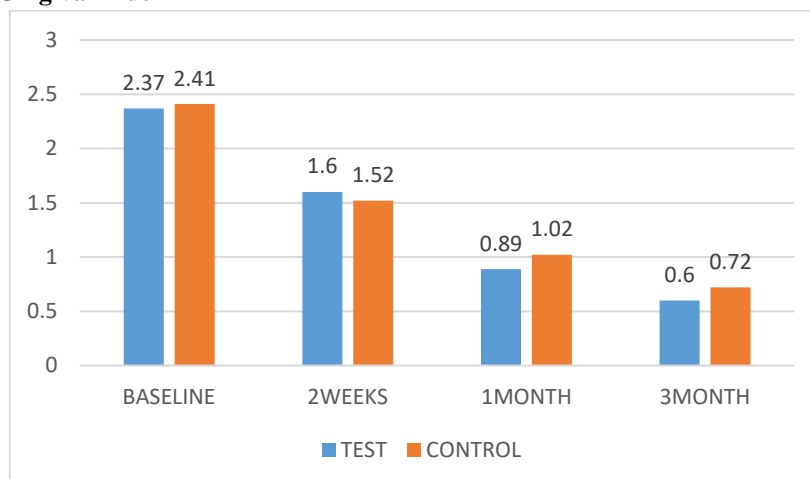


4.2 Graph:

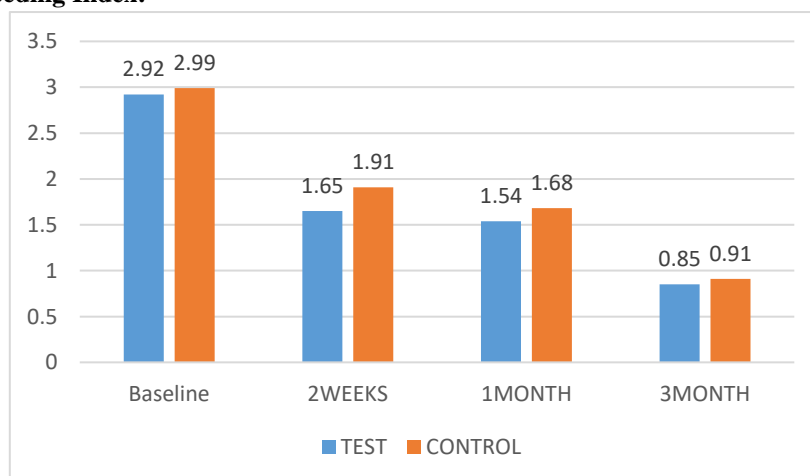
4.2.1 Mean Modified Plaque Index



4.2.2 Mean Modified Gingival Index



4.2.3 Mean Sulcus Bleeding Index:





4.3 Tables:

4.3.1 Plaque Index:

Table 1: Comparison of mean plaque index score between test group (Cyanoacrylate tissue adhesive) and control group (Suture materials) at various time periods:

Parameters	Time Period	Group	Mean	Standard Deviation	p-value*
PLAQUE INDEX	Baseline	Test	0.39	0.172	0.706
		Control	0.36	0.168	
	2 Weeks	Test	0.89	0.490	0.052
		Control	1.08	0.399	
	1 Month	Test	0.71	0.669	0.166
		Control	0.79	0.218	
	3 Month	Test	0.61	0.412	0.015*
		Control	0.66	0.222	

*p<0.05 – statistically significant

4.3.2 Modified Gingival Index:

Table 2: Comparison of mean modified gingival index score between test group (Cyanoacrylate tissue adhesive) and control group (Suture materials) at various time periods:

Parameters	Time Period	Group	Mean	Standard Deviation	p-value*
MODIFIED GINGIVAL INDEX	Baseline	Test	2.37	0.476	0.253
		Control	2.41	0.438	
	2 Weeks	Test	1.60	0.454	0.095
		Control	1.52	0.444	
	1 Month	Test	0.89	0.479	0.137
		Control	1.02	0.348	
	3 Month	Test	0.60	0.305	0.023*
		Control	0.72	0.518	

*p<0.05 – statistically significant

4.3.3 Sulcus Bleeding Index:

Table 3: Comparison of mean sulcus bleeding index score between test group (Cyanoacrylate tissue adhesive) and control group (Suture materials) at various time periods:

Parameters	Time Period	Group	Mean	Standard Deviation	p-value*
SULCUS BLEEDING INDEX	Baseline	Test	2.92	0.569	0.536
		Control	2.99	0.525	
	2 Weeks	Test	1.65	0.408	0.790
		Control	1.91	0.822	
	1 Month	Test	1.54	0.678	0.387
		Control	1.68	0.547	
	3 Month	Test	0.85	0.554	0.339
		Control	0.91	0.378	

*p<0.05 – statistically significant



5. Discussion:

Healing after closure of wound can be enhanced by precise approximation of incised margins, which is critical to favorable functional results and proper isolation of wound as mentioned by **Gassener R. et al. (2002)[7]**. Isoamyl-2-cyanoacrylate is among the newest member of cyanoacrylate family which is biocompatible and has good working properties such as flow rate and setting time as mentioned by **Turkaslan T. et al. (2005)[8]**. Increased plaque index at 2weeks postoperatively in control site is due to patient's difficulty in maintaining hygiene at surgical site due to sutures causing irritation and trauma, also acts as anchoring agent of plaque and harboring pathogenic bacteria, this phenomenon is called 'wicking' [9]. A significant reduction of plaque index was seen in test group compared to control group at 1month and 3month. A statistically significant improvement of modified gingival index in the control group (Sutures) than test group (Adhesive) was evident 2 weeks postoperatively, which signifies that cyanoacrylate tissue adhesive present in the tissue provoked inflammatory response with marked neutrophil recruitment, angiogenesis and presence of some eosinophil and giant cells during the first week [10]. There was a significant improvement in the gingival index of test group (Adhesive) than control group (Sutures) seen at 1month and 3month, because of formation of neo-capillaries was higher in the healing tissue with collagen and fiber formation in cyanoacrylate site than sutured site [11]. A continuous and stabilized blood clot is required for regeneration of epithelial attachment and prevent the invasion of micro-organisms as mentioned by **Cortellini P. et al. (2015)[12]**. A statistically significant reduction of sulcus bleeding index was seen in test group as compared to control group from baseline, 2weeks, 1month and 3month, which signifies Cyanoacrylate showed a better healing with good bonding properties and strength, as the adhesive polymerizes the moment it comes in contact with moisture and even blood and forms long and stable chain through covalent bonds and Van Der Waals force [13]. Due to this property, it can hold the approximated tissue in position together and hence a good hemostatic agent compared to silk sutures [14]. From the result of the study, it is clear that the healing after 1month was better in the site where cyanoacrylate was applied compared to the sutured site. Isoamyl-2-cyanoacrylate tissue adhesive results in better wound healing as

compared to silk sutures, which is in relation with **Vaaka PH. Et al. (2013)[15]**. As it has advantages such as immediate hemostasis, easy application, no technical skill is required, patient acceptance, esthetically more acceptable, noninvasive, less chair side time, absence of postsurgical pain or infection, easy maintenance, and no food lodgment. Considering these points, it is easy, common, and convenient to utilize Isoamyl 2-cyanoacrylate for closure following periodontal flap surgery.

6. Conclusion:

From the results of the present study, we arrive at the following conclusion, Cyanoacrylate tissue adhesive is clinically effective in stabilization of flap and can be used as an excellent alternative to non-resorbable silk sutures. Improvement in plaque index, modified gingival index and sulcus bleeding index were found to be favorable in test group (Cyanoacrylate tissue adhesive) than control group (non-resorbable suture). Isoamyl-2-cyanoacrylate tissue adhesive was safe to use, without causing any immunologic or antigenic reactions in any of the patients

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