

Surgical Bonding Brilliance: A Comparative Split-Mouth Analysis of Isoamyl Cyanoacrylate Tissue Adhesive and Silk Suture in Periodontal Flap Closure

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Abstract

Aim: The aim of this study was to compare the effectiveness of iso-amyl cyanoacrylate tissue adhesive to conventional silk suture based on postoperative pain, swelling, bleeding, and healing after periodontal flap surgery. **Materials and Methods:** The split mouth study was carried out on 20 patients who needed flap surgery for pocket therapy. The outcome measured was plaque index (PI), pre and 1 week after flap surgery, wound healing index (HI), and visual analog scale (VAS) score for discomfort, esthetics, and ease of maintenance 1 week post-operative. Paired t-test was used for intragroup post-procedure improvement in each parameter, and independent sample t-test was used for intergroup comparison. **Results:** Baseline values of PI between both groups were not significant statistically ($P > 0.05$). There was a statistical significance ($P < 0.05$) between the post-surgically values of PI in cyanoacrylate group and suture group. The post-operative value for VAS in Group A was 4.0 ± 1.7 and for Group B, it was 1.7 ± 0.67 and difference between both groups was statistically significant. Similarly The post-operative value for HI in Group A was 2.0 ± 0.66 and for Group B was 2.7 ± 0.48 and difference between both groups was statistically significant ($P \leq 0.05$). **Conclusion:** The study suggests that iso-amyl cyanoacrylate can be a preferable alternative in periodontal flap surgery, providing benefits in terms of simplicity, patient satisfaction, and overall efficacy.

Keywords: Cyanoacrylate, Iso-amyl cyanoacrylate tissue adhesive, Periodontal flap, Plaque index.

INTRODUCTION

The therapy of moderate to deep periodontal pockets frequently involves periodontal flap surgery. To achieve a primary union between the flap margins and create a healthy dento-gingival junction, the periodontal flaps must be closed after surgery. To keep the flap in place, sutures are frequently utilized. Suture materials that are frequently utilized include silk, nylon, catgut, and polyglycolic poly lactic acid derivatives. Some drawbacks of traditional suture material include tissue trauma brought on by needle penetration, scarring, subsequent infections, the requirement for sterilization, and the need for a second visit for suture removal. In addition, silk suture can “wick down” through which germs can enter the underlying tissues, increasing the risk of subsequent infection at the surgical site.^[1]

The bacterium most frequently linked to wound infection is *Staphylococcus aureus*; other microbes include *Pseudomonas aeruginosa*, *Enterobacteriaceae*, and *Enterococcus* spp. additionally, opportunistic fungi like *Candida*.^[2]

In 1959, Coover was the first to successfully synthesize cyanoacrylate. Cyanoacrylate has the chemical formula $H_2C = C(CN)COOR$, where R- is any alkyl group from methyl to decyl. Based on the length and complexity of their chains, cyanoacrylates available in a variety of forms; they incorporate methyl, ethyl, octylisoamyl, isohexyl, n-butyl, and cyanoacrylates. ISO Amyl cyanoacrylate adhesives have been employed in dentistry and medicine despite some opposing viewpoints. Cyanoacrylates have been used successfully in surgical applications for the repair of organs, nerves, skin, mucosa grafts, vessels, closure of laceration wounds and incisions, and treatment of intraoral wounds, extraction sockets

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fixation of free gingival grafts, fixation of mandibular fractures and healing of periodontal flaps.^[3,4]

In the current study, the efficiency of silk sutures against iso-amyl cyanoacrylate tissue glue in closing periodontal flaps was compared.

MATERIALS AND METHODS

The study was designed as split mouth randomized controlled trial compared between iso-amyl cyanoacrylate tissue adhesive versus conventional silk suture. A total 20 patients with generalized chronic periodontitis with horizontal bone loss and probing depth ≥ 5 mm visiting Department of Periodontics and Oral Implantology, Ahmedabad Dental College and Hospital were included in the study. The study was approved by the ethical committee. Patients with systemic disease, habit of smoking, pregnant and lactating women, angular bony defects, and those who have allergy to cyanoacrylate were excluded from this study.

All subjects were informed about study and written consent was obtained. Phase 1 periodontal therapy (scaling and root planning) was performed before surgical procedure. Patients were re-evaluated 4 weeks after the phase 1 therapy, during which all the baseline scores were recorded.

Surgical procedure

Twenty patients were randomly split into two groups. In Group A, before surgical procedure area was anesthetized with a 2% lignocaine hydrochloride solution (1:200,000) with adrenaline then full thickness mucoperiosteal flap was reflected and root surface was thoroughly debrided (Figure 1) and flap was approximated with the help of 3-0 silk suture (Figure 2) for Group B, surgical procedure performed same as the Group A (Figure 3) but the flap approximated using the iso-amyl cyanoacrylate tissue adhesive (Figures 4 and 5). There was no periodontal dressing applied in both groups. Postoperatively, patients were instructed not to brush his/her teeth at the surgical site for 1 week to avoid trauma at the treated site. Oral hygiene instructions were given. Chlorhexidine mouthwash 0.12% was prescribed, to be used

twice a day for 2 weeks. Medication combination of analgesics (a combination of Aceclofenac 100 mg and Paracetamol 325 mg) and antibiotics (Amoxicillin 500 mg 3 times daily) were prescribed. Sutures were removed after 1 week (Figure 6) and post-operative parameters were measured (Figure 7). Parameters were measured at baseline and after 1-week postoperatively are plaque index (PI) (*Loe and Silness*) healing index (HI) and visual analog scale (VAS).



Figure 2: 3-0 silk suture for flap closure



Figure 3: Flap elevation group B



Figure 1: (Flap elevation)

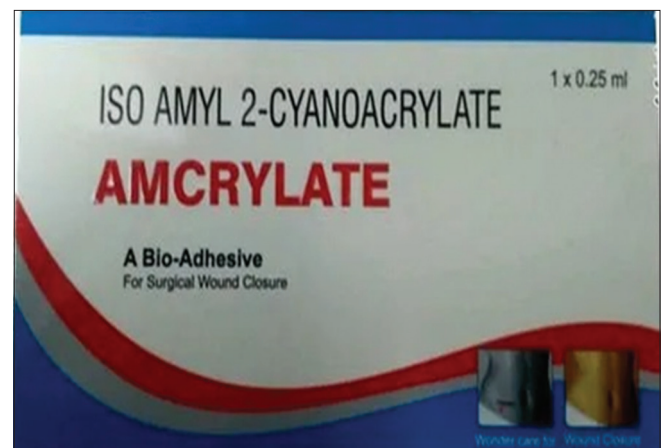


Figure 4: Iso-amyl cyanoacrylate tissue adhesive



Figure 5: Application of Iso-amyl cyanoacrylate



Figure 6: (Follow up group A)



Figure 7: (Follow up group B)

Statistical analysis

The recorded data were compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means

Table 1: Pre- and post-values of plaque index

Variable	Plaque index Mean $\pm$ SD		P-value
	Baseline	7 th day	
Suture	1.8 $\pm$ 0.78	2.1 $\pm$ 0.56	0.34
Cyanoacrylate	2.0 $\pm$ 0.81	1.4 $\pm$ 0.51	0.05*
P-value	0.58	0.01*	

*indicate statistically significance at $P \leq 0.05$

Table 2: Mean values of VAS and HI at 7th day

Variable	VAS		HI	
	Mean	SD	Mean	SD
Suture	4.0	0.81	2.0	0.66
Cyanoacrylate	1.7	0.67	2.7	0.48
P-value	0.001*		0.01*	

*indicate statistically significance at $P \leq 0.05$, HI: Healing index, VAS: Visual analogue scale

and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5%, respectively.

RESULTS

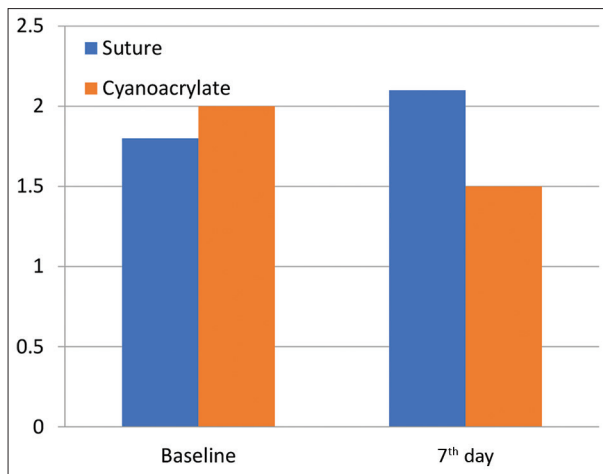
Table 1 describes pre- and post-values of PI between both groups. The data were analyzed using t-test and it was found that the baseline values of PI between both groups were not significant statistically ($P > 0.05$). There was a statistical significance ($P < 0.05$) between the pre- and post-values of PI in Cyanoacrylate group while in suture group values were non-significant ($P > 0.05$) (Graph 1).

Table 2 describes difference between mean values of VAS and HI at 7th day. The post-operative value for VAS in Group 1 was 4.0 ± 1.7 and for Group B, it was 1.7 ± 0.67 and difference between both groups was statistically significant (Graph 2). Similarly, the post-operative value for HI in Group 1 was 2.0 ± 0.66 and for Group 2, it was 2.7 ± 0.48 and difference between both groups was statistically significant ($P \leq 0.05$) (Graph 3).

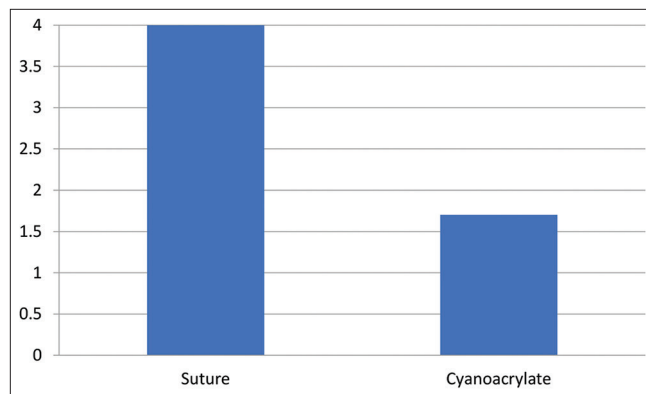
DISCUSSION

Cyanoacrylate adhesives have been widely employed in intraoral surgical operations. These adhesives have a long handling time and polymerize in the presence of hydroxyl ions found in oral tissues, resulting in a slightly exothermic polymerization reaction. They act as a mechanical barrier, hastening epithelial keratinization and promoting fast wound healing.^[4-6]

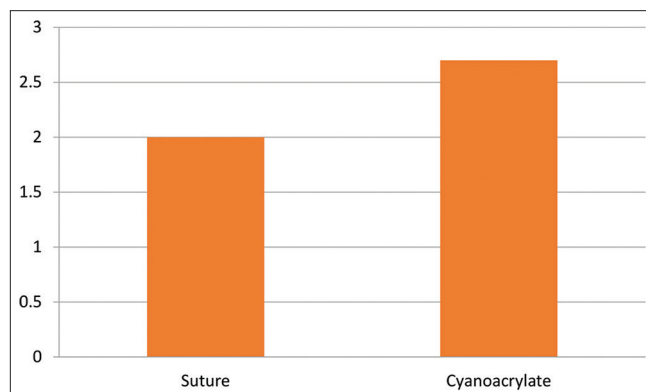
The purpose of this study was to compare the effectiveness of iso-amyl cyanoacrylate tissue adhesive to conventional silk suture based on postoperative pain, swelling, bleeding, and Healing after periodontal flap surgery. Traditional suturing procedures include advantages such as maximum resilience strength, minimum dehiscence rate, and excellent tissue



Graph 1: Pre- and post-values of plaque index



Graph 2: Mean values of visual analog scale at 7th day



Graph 3: Mean values of healing index at 7th day

approximation.^[7] Certain disadvantages include accidental harm, the requirement for local anaesthesia administration, the possibility of microorganisms penetrating deeper tissue layers, being method sensitive, and taking time. Excessive force on the wound's edges generated ischemia of the wound margin, resulting in a repulsive scar and apparent cross-hatching.^[8,9] Patients are also needed to return for suture removal, which increases patient discomfort and the risk of puncture accidents for medical professionals and support personnel.

When compared to traditional suture materials, iso-amyl saves chair side time because it is easy to use, and it also improves patient compliance due to less pain and superior esthetics.^[10]

In this study, PI at baseline and 1-week postoperatively assessed in both groups. The cyanoacrylate group had a statistically significant mean reduction in post-operative PI scores, whereas the silk group had an increase, which could be attributed to the patient refraining from mechanical oral hygiene procedures and the silk suture collecting plaque due to its multi-filamentous nature.^[3] The finding of this study were in accordance with the results reported by Binnie and Forrest,^[11] Giray *et al.*^[12]

In this study, HI was significantly superior in cyanoacrylate group compare to silk group. Similar study reported by Vastani and Maria^[9] conducted a study including 30 patients who underwent an alveoloplasty procedure with suturing on one side and isoamyl cyanoacrylate application on the other side. For up to 14 days, sensitivity and erythema were significantly lesser with the cyanoacrylate than with sutures. No patient showed infection or wound dehiscence at cyanoacrylate-treated site. These findings indicated that inflammation after wound closure is greater with sutures than with cyanoacrylate adhesives.^[12] Stavropoulou *et al.* studied the recovery of the palatal donor site after connective tissue graft harvesting using polytetrafluoroethylene suture versus cyanoacrylates. Using the modified wound HI, the authors determined that there were no significant variations in donor site healing.^[13]

Surgical procedures using cyanoacrylate are beneficial because it reduces fatigue to the surgeon, reduces post-operative swelling, and operating time is easier to apply than suture, more comfortable to the patient.

The VAS scores revealed a substantial difference between the two groups in terms of postoperative discomfort, esthetics, and ease of maintenance, which matched the findings of previous investigations.^[14,15] Joshi *et al.* compared sutures with an isoamyl cyanoacrylate adhesive for wound closure after third-molar disimpaction procedures in 30 patients. Pain during the first 3 days after surgery and bleeding were significantly lesser with the cyanoacrylate adhesive than with sutures. The authors concluded that cyanoacrylate adhesives are associated with minimal inflammation and tissue manipulation when compared with sutures.^[8]

CONCLUSION

Iso-amyl cyanoacrylate tissue adhesive is more effective than silk sutures in periodontal flap surgery. The adhesive offers advantages such as immediate hemostasis, easy application, and better patient acceptance, leading to improved postoperative outcomes, including reduced PI, superior HI, and favorable VAS scores. The study suggests that iso-amyl cyanoacrylate can be a preferable alternative in periodontal flap surgery, providing benefits in terms of simplicity, patient satisfaction, and overall efficacy.

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