

Evaluation and comparison of healing of periodontal flaps when approximated with silk sutures and n-butyl cyanoacrylate - A clinical study

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Abstract

Introduction: Periodontal flap surgical procedures are commonly used for elimination of periodontitis with moderate to deep pockets. For flap approximation silk suture is used commonly for flap approximation. It is associated with some complications and disadvantages; a need for an alternative for suture is always felt. N-butyl cyanoacrylate is a tissue adhesive used for flap approximation.

Objective: To evaluate and compare healing of periodontal flaps when closed with surgical silk sutures and n-butyl cyanoacrylate.

Materials and Methods: The study were conducted on 30 sites on 15 patients diagnosed with chronic generalized periodontitis and indicated for periodontal flap surgery selected for the study after satisfying inclusion and exclusion criteria and randomly allocated into two groups as control and test groups. Clinical indices, objective and subjective parameters were assessed on postoperative 1st day, 7th day, 14th day and

21st day. Results revealed a significant improvement in healing for all the clinical parameters in Group A and Group B after flap surgery despite using suture or cyanoacrylate for flap margin approximation. However N-butyl cyanoacrylate displayed significantly superior results.

Summary

The present study aimed to evaluate and compare healing of periodontal flaps when closed with surgical silk sutures and n-butyl cyanoacrylate. 30 sites having in 15 patients were included into the present study and these 30 sites were divided into 2 groups (Group A: Silk suture and Group B: N-butyl cyanoacrylate). Clinical parameters (PPD, PI, SBI) for each group were recorded at baseline, followed by Plaque Index (PI), Sulcus Bleeding Index (SBI), Gingival Index (GI), Papillary Marginal Attachment (PMA), Early Healing Index (EHI) were recorded on post operative 7th day, 14th day and 21st day. Also, subjective and objective criteria were recorded on post operative 1st day and 7th day. Results revealed a significant improvement in healing for all the clinical parameters in Group A and Group B after flap surgery despite using suture or cyanoacrylate for flap margin approximation. However, N-butyl cyanoacrylate displayed significantly superior results for parameters PI, GI, SBI, PMA and EHI at post operative 7, 14 and 21 days. Further in terms of objective and subjective parameters patients were more comfortable with cyanoacrylate than silk sutures.

Keywords: Flap Surgery, N-butyl cyanoacrylate, Silk suture

Introduction

The main goal of periodontal flap surgery is healing by primary intention.¹ Materials like silk, vicryl, polyester, catgut and polyglycolic-poly-lactic acid derivatives are being used

for flap approximation. Braided silk is the most common suture used for the flap closure. 2 But it has its own complications like it increases the risk of wound sepsis by serving as an adherent foreign body, stitch abscess, epithelial inclusion cyst, and railroad track scar due to invasion of the underlying epithelial layer. Moreover, the wound approximation by suture is time consuming and leads to more amount of scar formation. 3,4 Further it can cause tissue perforation in thin gingival biotype. Hence a need for an alternative to suture is felt.⁵

The use of tissue adhesives as an alternative to or replacement for sutures in wound closure has long been an area of interest. A group of these tissue adhesives are cyanoacrylates.³

N-butyl-cyanoacrylate has become the standard tissue adhesive as it offers advantages such as effective and immediate haemostasis, bacteriostatic properties, and rapid adhesion to soft and hard tissue⁶

Literature search reveals few studies on N-butyl cyanoacrylate used as an adhesive material for periodontal flap closure. Further, these studies evaluated the benefits of the material using a small sample size and in anterior sites only. Thus, the purpose of this study was to compare the clinical healing of periodontal flaps that were closed by sutures with that obtained using n-butyl cyanoacrylate glue on both anterior and posterior sites.

Materials and Methods

This study is a randomized controlled clinical trial, in which a total of 30 sites diagnosed with chronic generalized periodontitis and indicated for periodontal flap surgery in at least one quadrant were selected from those attending the department of Periodontics and department of Oral medicine at Triveni Institute of Dental Sciences, Hospital and Research Centre, Bilaspur, Chhattisgarh.

Inclusion criteria

- Systemically healthy patients with the age range of 20 to 60 years of age range. λ Presence of 14 or more scorable teeth.
- Moderate to severe periodontitis having pocket depth of 6mm or more.
- Gingival index of 1 or more; Plaque index score of 1.5 or more.

Exclusion criteria

- Subjects allergic to n-butyl cyanoacrylate glue.
- Subjects with any systemic diseases.
- Smokers and other tobacco product consumers.
- Pregnant/ lactating mother.
- History of periodontal treatment in past 3 months prior to study.

Study was explained to the subjects and a written consent was taken from those who were interested to participate in the study.

A total of 30 sites diagnosed with chronic generalized periodontitis and indicated for periodontal flap surgery in at least one quadrant were chosen for the study based upon the inclusion and exclusion criteria. Following initial non-surgical therapy including scaling and root planing, subjects were recalled for the surgical phase under the standard protocols.

Two groups were formed for the study

Group A: comprised of 15 sites where flap surgery was done and those sites were sutured using black silk suture for flap approximation after flap surgery.

Group B: comprised of 15 sites where flap surgery was done and those sites were approximated with Nbutyl cyanoacrylate after flap surgery.

Under aseptic condition, patients were anesthetized with 2% lidocaine with epinephrine, 1:100000 local anaesthesia, incisions were placed intracrevicular and a full thickness mucoperiosteal flap were elevated and

followed by thorough debridement and root planing. Following this and prior to flap closure, selection of sites for surgical suture and n-butylcyanoacrylate were done randomly. Interdental areas between central-lateral, lateral –canine, canine-I premolar, I premolar- II premolar, II premolar – I molar and I molar – II molar were considered for either placement of black silk sutures or n-butyl cyanoacrylate. Of the total 6 sites in each patient, 3 inter dentals were considered in group A (surgical silk suture) and the rest 3 interdental sites were considered in group B (n-butyl cyanoacrylate). Simple loop interdental ligation with 3-0 black braided silk suture were placed on the randomly allocated 3 sites. (Fig 1)

The application of the nbutylcyanoacrylate was done on the other 3 surgical sites. (Fig 2) The monomer is applied as small drops directly on the incision line and allowed to dry. The fluid quickly polymerizes to form a solid film within 1 min. The solution may be applied as interrupted drops or as a continuous film extending up to 5 mm from the wound edges. Hemostasis is secured and the after the edges are clean and dry they are held in approximation during polymerization. Care were taken as not to spill the material on to other areas of the oral cavity such as buccal mucosa, vestibule and tongue. Swabs, gloves, and instruments were kept clear of the adhesive as they will stick to; remnant material that was adhered to instruments was removed using acetone.

After flap approximation, no periodontal dressings were placed. Postoperative instructions were given. No antibiotics and analgesics were prescribed. All the subjects were recalled next day (Post operative day 1) for clinical examination, Presence or absence of Swelling, Bleeding, Wound infection & Wound dehiscence were recorded at all the study sites for Group

A and Group B. These data recorded were considered as postoperative Day 1 scores.

All subjects in Group A and Group B were recalled after 7 days for removal of suture and n-butyl cyanoacrylate and for the following clinical assessment.

1. Clinical indices including PI, SBI, GI, PMA & EHI.
2. Subjective parameters- Pain, Burning sensation, Esthetically acceptance
3. Objective parameters- Crater formation, redness, material alba, and loss of material were recorded at all study sites for Group A and Group B. These data recorded were considered as postoperative Day 7 scores. Further, sutures and cyanoacrylate adhesives were removed on Day 7 and OHI were given.

All the subjects were recalled on 14th day and 21st day for recording the clinical indices including PI, SBI, GI, PMA & EHI. (Fig 3 and 4) This data recorded were considered as postoperative day 14 and day 21 scores respectively. All the data thus obtained was subjected to statistical analysis.



Fig 1



Fig 2



Fig 3



Fig 4

Results

Table 1 result reveals consistent decrease in Plaque index score in intragroup comparison from baseline to post-operative 21st day in both group A and B which is

highly significant. The intergroup comparison shows highly significant scores at post-operative 21st day whereas at baseline it was not significant.

Table 1

Plaque index	Group A	Group B	P value
At baseline	1.94±0.35	2.15±0.43	0.15
At 21st day	1.22±0.23	0.7±0.34	<0.001
P value	<0.001	<0.001	

Table 2 results reveals consistent decrease in Sulcus Bleeding index score in intragroup comparison from baseline to post-operative 21st day in both group A and B which is highly significant. The intergroup comparison shows highly significant scores at post-operative 21st day whereas at baseline it was not significant.

Table 2

Sulcus Bleeding Index	Group A	Group B	P value
At baseline	3.04±0.39	3.15±0.42	0.45
At 21st day	1.34±0.56	0.79±0.37	<0.001
P value	<0.001	<0.001	

Table 3 results reveals highly significant Gingival Index scores in both the groups in intragroup and intergroup comparison at 7th day and 21st day respectively.

Table 3

Gingival Index	Group A	Group B	P value
7th day	1.66±0.29	1.2±0.5	<0.001
At 21st day	1.19±0.27	0.59±0.38	<0.001
P value	<0.001	<0.001	

Table 4 results reveals highly significant Papillary Marginal Attachment Index scores in both the groups in intragroup and intergroup comparison at 7th day and 21st day respectively.

Table 4

PMA Index	Group A	Group B	P value
7th day	1.79±0.72	1.18±0.4	<0.001
At 21st day	1.1±0.38	0.71±0.25	<0.001
P value	<0.001	<0.001	

Table 5 result reveals highly significant EHI scores in intergroup comparison between group A and group B whereas no significant difference in intragroup comparison between the groups at post operative 14th and 21st day respectively.

Table 5

Early Wound Healing Index (EHI)	Group A	Group B	P value
At 14th day	1.51±0.37	0.74±0.43	<0.001
At 21st day	1.18±0.45	0.51±0.29	<0.001
P value	0.053	0.074	

Table 6 result reveals no incidences of wound infection and wound dehiscence in both the groups whereas higher incidence of swelling 13(86.67%) in and bleeding 13(86.67%) in group A than in group B swelling 4(26.67%) and bleeding scores 4(26.67%).

Table 6

At Post operative day 1	Group A	Group B	P value
Swelling	13(86.67%)	4(26.67%)	0.0009
Bleeding	13(86.67%)	4(26.67%)	0.0009
Wound Infection	0	0	
Wound Dehiscence	0	0	

Table 7 shows comparison of sites for Subjective and Objective criteria including Burning, esthetically acceptable, Redness, Material Alba, Crater formation and Loss of Material scores at post-operative day 7. Results reveal that all of the sites in Group B 15(100%) showed Esthetic acceptance while none of the sites in Group A showed the same with highly significant differences between the two groups. The incidence for the presence of Material Alba of sites in Group A 13(86.67%) were higher than sites in Group B 7(46.67%) with statistically significant differences Table 7 shows comparison of sites for Subjective and Objective criteria including Burning, esthetically acceptable, Redness, Material Alba, Crater formation and Loss of Material scores at post operative day 7. Results reveal that all of the sites in Group B 15(100%) showed Esthetic acceptance while none of the sites in Group A showed the same with highly significant differences between the two groups. The incidence for the presence of Material Alba of sites in Group A 13(86.67%) were higher than sites in Group B 7(46.67%) with statistically significant differences.

Table 7

At 7th day	Group A	Group B	P value
Burning	0	0	
Esthetically	15(100%)	0	<0.001
Redness	9(60%)	4(26.67%)	0.065
Materia Alba	13(86.67%)	7(46.67%)	0.02
Crater	0	0	
Loss of material	15(100%)	12(80%)	0.067

Discussion

The present study was undertaken to evaluate the clinical benefits of n-butyl cyanoacrylate as an alternative to or replacement for sutures in wound closure after periodontal flap surgery. Removal of the inflamed granulation tissue from periodontal pockets, subgingival plaque and calculus accompanied by root planing and proper tissue adaptation at the tooth bone junction does cause to a frank decrease in tissue inflammation thus leading to an improvement in the gingival index and bleeding index scores. The significantly higher PI, GI, SBI and PMA scores in Group A can be attributed to the plaque retention of the suture material causing a trigger in the inflammatory response. Also Silk material itself is a foreign body and hence it is capable of causing foreign body reaction by the immune system which can cause inflammation of the gingiva. Cyanoacrylate being an inert material and when placed on the gingival tissues for adaptation, covers the area as a thin but firm film with minimal inflammatory response in the region of use with zero potential for necrosis or allergic reactions⁷. The sutured side showed a greater incidence of tenderness and erythema. This is in agreement with Vast ani et al 2013⁴ who observed moderate to severe inflammatory response on the suture site and mild to moderate inflammatory response on the glued site. In both the groups healing of tissues occurred without any

visible loss of material and opening of flaps. But cyanoacrylate sites displayed significantly better healing as compared to the suture sites. Though suturing of tissues using silk or other sutures do display good healing response, sutures do have inherent disadvantages. Piercing the tissue for suturing itself leads to fresh injury that needs time to heal. Further, suturing of oral tissues demands skill, time and patience. Patient compliance was assessed at post-operative 1st day and 7th day. Subjects had better acceptance for adhesives which they considered it to be more Esthetic than the black suture threads seen dangling in their mouth. Vyas et al 2018⁸ also reported similar results with regard to patient acceptance where he stated that the sites where isoamyl 2-cyanoacrylate was used, there was absence of pain, discomfort, burning and itching sensations. It was also more aesthetically acceptable by all patient subjects. In this study, no incidence of wound infection and wound dehiscence were observed in both the groups at post-operative 1st day. The present study also evaluated for any incidence of bleeding on post-operative Day 1. Accordingly, the bleeding score was significantly higher in suture site than cyanoacrylate site. This finding is in accordance with the studies conducted by Pini Prato. There was no bleeding after approximation in areas where cyanoacrylate was applied, whereas in those approximated with sutures, there was bleeding after 1 minute.

Overall the result of the present study favours the use of cyanoacrylate as an effective method for flap approximation. The possible shortcomings of the present study are the modest sample size and a shorter follow up for evaluation considered in the study. Further study should enrol a large number of subjects with long term follow up so that the result can be extrapolated for Cyanoacrylate use as an alternative for sutures.

Conclusion

With the limitations of the study, it can be concluded that n-butyl cyanoacrylate can be used for tissue approximation after periodontal flap surgery as an alternative to silk sutures. Additional studies on making these products easier to apply and more accessible should be conducted, aiming at increasing the use of n-butyl cyanoacrylate in surgical specialties, especially in areas where aesthetics demands are high. However, a larger sample size and longer follow up is required to assess the long term beneficial effects of cyanoacrylate in healing of gingival tissue.

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