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Research Paper

Comparative Evaluation of Intra-oral Wound Healing with Silk Suture v/s. n-butyl-2-cyanoacrylate after Alveoloplasty

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ABSTRACT

***Background**:*

Effective crack check is a pivotal element of intraoral surgical procedures. While conventional non-absorbable sutures remain extensively used, indispensable styles similar as synthetic absorbable sutures, towel bonds, and surgical masses have gained adding acceptance in recent times. Among these, cyanoacrylate- grounded towel bonds have demonstrated notable biocompatibility and ease of operation. In order to promote intraoral crack mending after alveoloplasty, the current investigation compared the clinical concerns of 3-0 silk sutures and n-butyl-2-cyanoacrylate glue.

***Materials & Methods**:*

This prospective clinical trial was conducted on 20 cases taking bilateral alveoloplasty in the same dental bow (maxillary or mandibular). Individuals with previous oral diseases or systemic ails were excluded. In each case, one surgical point was closed using n- butyl-2-cyanoacrylate, while the contralateral point was secured with 3- 0 pleated silk sutures. Parameters estimated included time needed for crack check, achievement of intraoperative and postoperative haemostasis, interval before first deliverance analgesic input, postoperative pain intensity, and rate of crack mending.

***Results**:*

Closure with n- butyl-2-cyanoacrylate demonstrated superior haemostatic control, significantly reduced operative time, dropped postoperative pain, and faster crack mending compared to 3- 0 silk sutures.

***Conclusion**:*

Within the limitations of this study, n- butyl-2-cyanoacrylate can be considered a practical and effective volition to conventional silk sutures for intraoral crack check after alveoloplasty, offering bettered haemostasis, lesser patient comfort, and enhanced mending issues.

KEYWORDS: Cyanoacrylate, n-butyl-2-cyanoacrylate, Towel glue, Silk sutures, Alveoloplasty

INTRODUCTION

Preface Following any surgical procedure, icing proper crack check remains a matter of critical concern. Surgical injuries can be managed through various check ways; still, the primary objects remain constant — minimizing the trouble of infection, barring dead space, and precisely approaching crack peripheries to achieve optimal functional and aesthetic issues[1]. Crack mending progresses through four distinct and well-orchestrated phases haemostasis, inflammation, proliferation, and redoing. For successful recovery, these stages must do in the correct sequence and within applicable time frames[2].

Any disturbance or detention in one or further of these phases can vitiate healing. Prompt and secure check is therefore essential to avoid complications and promote smooth, uneventful recovery. Over the times, literature has proved a range of crack check styles, from traditional non-absorbable sutures to advanced options analogous as synthetic absorbable sutures, surgical millions, and kerchief bonds[3,4].

Despite their wide use, conventional suturing ways have notable limitations, including kerchief trauma, advanced trouble of postoperative infection, the need for original anaesthesia, longer procedure time, implicit needle- stick injuries to the motorist, and the demand for a fresh visit to remove sutures[5]. Cyanoacrylates, first synthesized by Ardis in 1949, are presto-acting bonds that polymerize within seconds upon contact with protein-rich shells, forming strong yet flexible bonds[6].

These parcels make them precious in a variety of surgical operations, including crack check, haemostasis, skin graft preoccupation, and other operative procedures[7]. Different types of cyanoacrylates are available — methyl, ethyl, n- butyl, isoamyl, isohexyl, and octyl — classified according to the length and complexity of their carbon chains[4]. Still, their limitations include fairly low tensile strength (making them incongruous for high-pressure injuries) and reduced effectiveness in wettish, disunion-prone areas analogous as the hands and bases. They are also contraindicated in cases with known perceptivity to formaldehyde or cyanoacrylate, those who are immunocompromised, and in the presence of infected injuries.

In light of these considerations, the present study was accepted to estimate and compare the clinical performance of two generally used paraphernalia — n-butyl-2-cyanoacrylate and silk sutures (Mersilk) for intraoral crack check in cases witnessing alveoloplasty.

A further end was to determine whether these paraphernalia could reduce operative time and minimize the frequency of postoperative follow-up visits.

MATERIALS AND METHODS

This study was carried out from May 2023 to November 2024 in the Pacific Dental College and Research Centre's Department of Oral and Maxillofacial Surgery in Udaipur.

It included 20 patients who required bilateral alveoloplasty in which one side 3-0 silk suture (Mersilk) were placed and on contralateral side n- butyl-2-cyanoacrylate were placed.

The 20 samples were divided into 2 groups as follows: Group I 3-0 silk suture (Mersilk) Group II N- butyl-2-cyanoacrylate in the same patient.

INCLUSION CRITERIA

- Both the male & female of age 18 years & above
- Patient with bilateral edentulous arches (Both in Maxillary & Mandibular arch) required Alveoloplasty

EXCLUSION CRITERIA

- Patient with any pre-existing pathology (oral cavity)
- Patient with systemic conditions including anaemia or diabetes

METHODOLOGY

All participants underwent through detailed case history, clinical examinations, standardized digital radiograph, and clinical photographs. A thorough clinical examination including both hard and soft tissue examinations were carried out.

Crestal incision was placed on alveolar mucosa. Mucoperiosteal flap was reflected as required and bony spicule or prominence was removed using bone rongeur and round bur. Smoothening of the arch was done using bone file. All procedure was carried out under local anaesthesia.

Group I used 3-0 silk suture (Mersilk) to close the flap, while Group II used n-butyl-2-cyanoacrylate.

Figure 1: Pre-operative

Figure 2(A): Intra-operative Group A (Incision Placed)

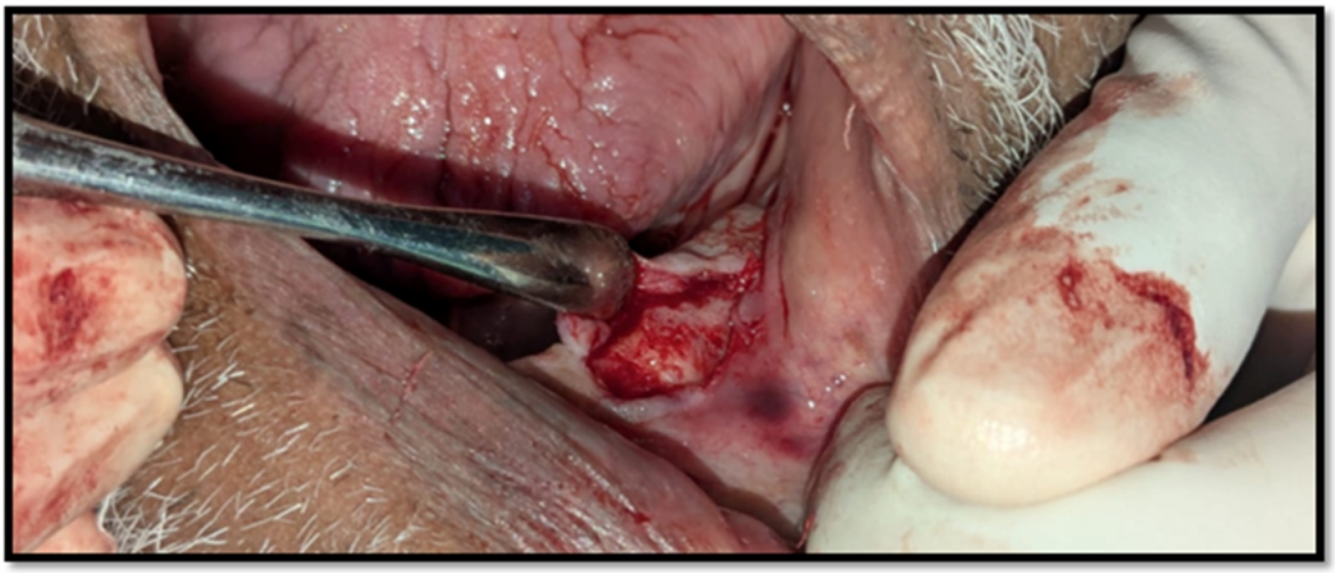

Figure 2(B): Intra-operative Group A (Bony Spicule Removed)

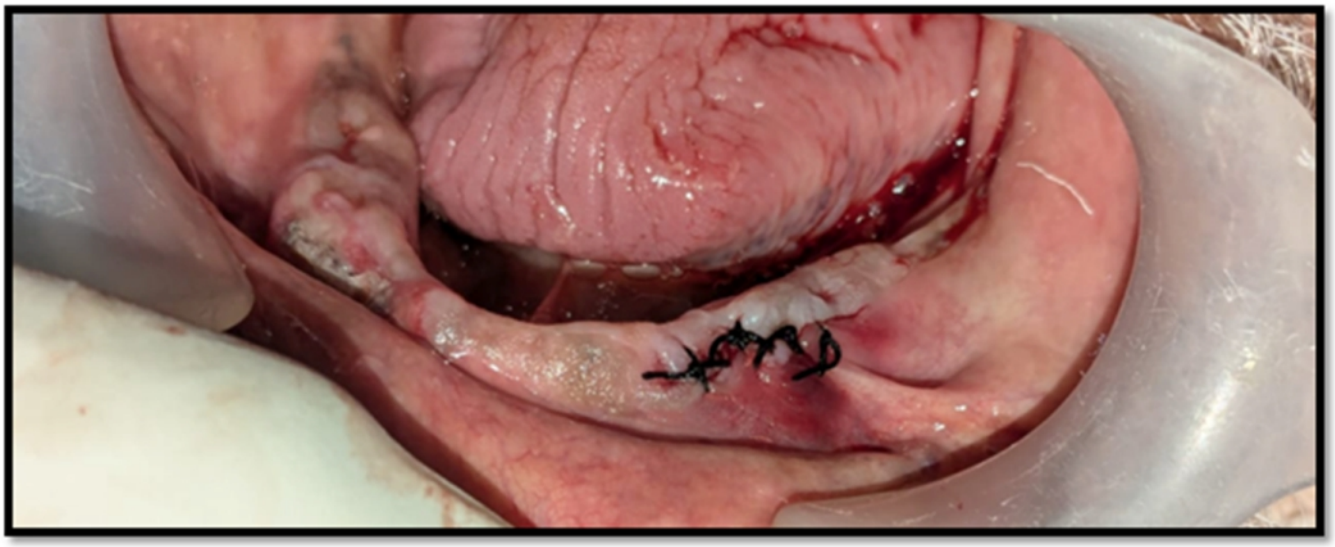

Figure 2 (C): Intra-operative Group A (Closure Done using Silk Suture - Mersilk)

Figure 3(A): Intra-operative Group B (Incision Placed)

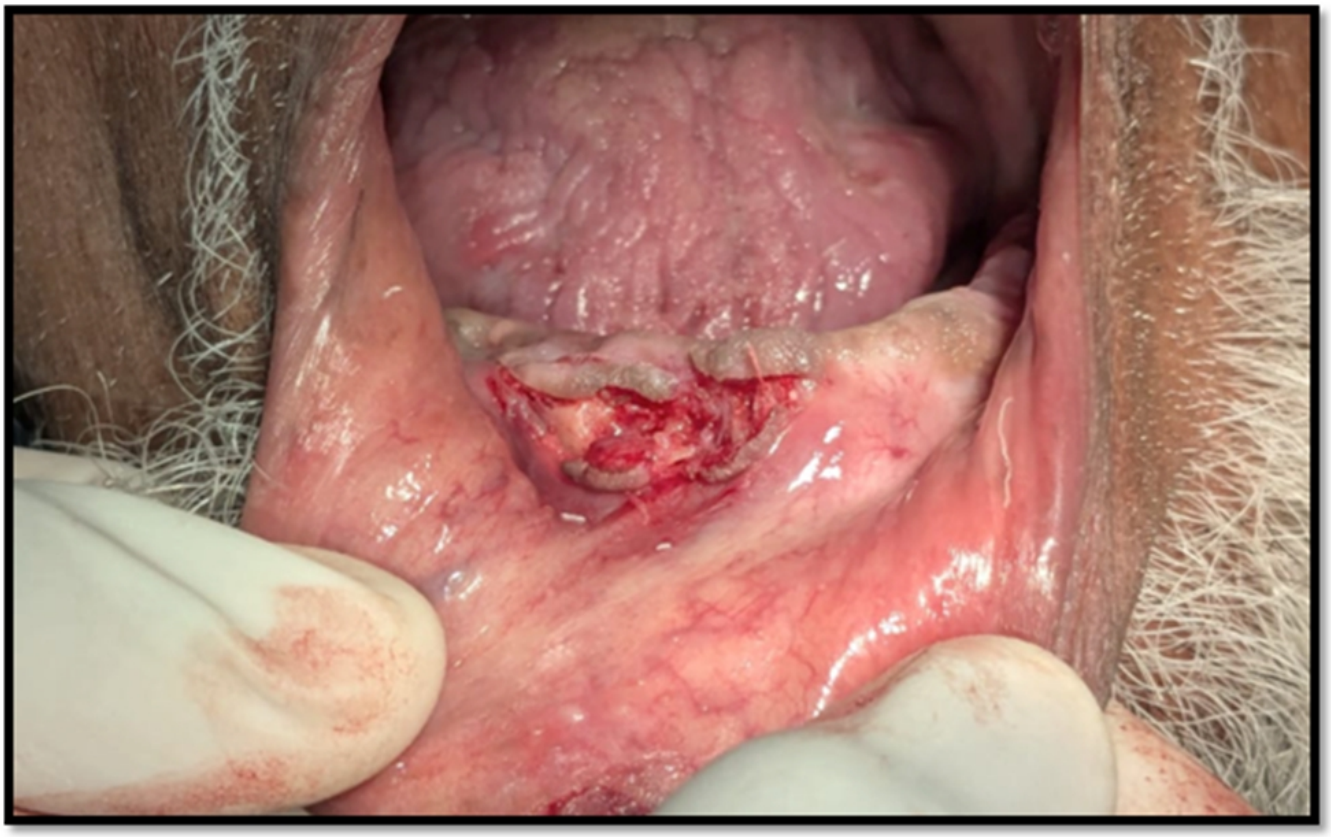

Figure 3(B): Intra-operative Group B (Bony Spicule Removed)

Figure 3 (C): Intra-operative Group B (Placing n-butyl 2-cyanoacrylate)

Figure 3 (D): Intra-operative Group B (Closer Done using n-butyl 2-cyanoacrylate)

Figure 4: Post-operative

RESULTS

Data analysis was performed using IBM SPSS Statistics software(interpretation 22.0; IBM Corp., Armonk, NY, USA). A statistically significant p-value was defined as less than 0.05.

Males made up 55% of the participants, while females made up 45%. The mean age of the study population was 62 years, with ages ranging from 40 to 80 years.

Out of the 20 patients enrolled, 2 individuals (10%) fell within the 40–49-year age range, 7 patients (35%) were between 50–59 years, another 7 patients (35%) were in the 60–69-year range, and 4 patients (20%) were aged between 70–80 years.

The average time needed for crack check in Group 1 was 3.77 ± 1.11 twinkles, compared with 0.91 ± 0.37 twinkles in Group 2. This resulted in a mean difference of 2.86 minutes ($p < 0.001$) [Table 1].

Group 1 took a normal of 2.71 ± 1.11 twinkles to reach hemostasis, whereas Group 2 took a normal of 0.44 ± 0.23 twinkles, with a mean difference of 2.26 twinkles ($P< 0.001$).

Group I had 41.2 of cases without discomfort, whereas Group II had 58.8. On the other hand, the prevalence of discomfort was 43.5 in Group II and 56.5 in Group II($\chi 2 = 0.921$, $P = 0.337$) [Table 2].

Table 1: Comparing the time (min.) to achieve wound closure

	GROUP	NO. OF PATIENTS	MEAN	SD	T (Min.)	P-VALUE	MEAN DIFFERENCE
TIME TO	I	20	3.770	1.1108	10.917	< 0.001	2.8600
WOUND CLOSURE	II	20	0.910	0.3726			

Table 2: Comparison of post operative pain in Group I and Group II

TIME INTERVAL	GROUP	MEAN	N	STD. DEVIATION	STD. ERROR MEAN	P VALUE
1ST DAY	Silk suture (Group 1)	5.960	20	2.030	0.287	0.001
	n-butyl-2-cyanoacrylate (Group 2)	3.280	20	1.796	0.254	
7TH DAY	Silk suture (Group 1)	5.220	20	1.556	0.220	0.002
	n-butyl-2-cyanoacrylate (Group 2)	2.420	20	1.052	0.149	

Group I and Group II had mean rank values of 18.50 and 22.50 for postoperative wound healing, respectively (Mann–Whitney U value = 160.00, P = 0.28). Both groups' wound healing was evaluated on the first and seventh days.

Crack mending was assessed on base of Landry, Turnbull, and Howley indicator. On 1st day in Group I, 02 patients had excellent healing 4 patients had very good healing 6 patients had good healing 4 patients had poor healing while 4 had very poor healing. In Group II, 7 patients had excellent healing while 5 patients had very good healing while 3 patients had good healing while 2 patients had poor healing while 3 patients had very poor healing [Table 3].

There was a statistically significant difference of 0.002 between the groups.

Table 3: Comparison of post-operative wound healing on 1st day in Group 1 & Group Il

GROUPS			FIRST DAY WHI					TOTAL	CHI SQUARE	P VALUE
			1	2	3	4	5			
I	Silk suture	Count	2	4	6	4	4	20	16.72	0.002
		%	10%	20%	30%	20%	20%	100%		
II	N-butyl-2-cyanoacrylate	Count	7	5	3	2	3	20		
		%	35%	25%	15%	10%	15%	100%		

{WHI- Wound Healing Index}

On 7th day in Group I, 3 patients had excellent healing 06 patients had very good healing 04 patients had good healing 05 patients had poor healing while 02 had very poor healing.

In Group II, 9 patients had excellent healing while 06 patient had very good healing while 03 patients had good healing while 01 patients had poor healing while 01 patient had very poor healing [Table 4].

There was a statistically significant difference of 0.010 between the groups.

Table 4: Comparison of post operative wound healing on 7th day in Group I & Group II

GROUPS			SEVENTH DAY WHI					TOTAL	CHI SQUARE	P VALUE
			1	2	3	4	5			
I	Silk suture	Count	3	6	4	5	2	20	22.165	0.010
		%	15%	30%	20%	25%	10%	100%		
II	N-butyl-2-cyanoacrylate	Count	9	6	3	1	1	20		
		%	45%	30%	15%	5%	5%	100%		

{WHI- wound healing index}

DISCUSSION

Restoring structural soft tissue support, lowering wound tension, and attaining everted skin margins are the main goals of wound closure principles. The most natural-looking appearance is achieved with accurate wound closure and precise approximation of the wound boundaries.

Suturing have been used as a prime module for treatment for various procedures for a long period of time. Various studies have been done of different types and methods of suturing. The advantage of suturing is ease of availability, technical ease etc. At the same it does carry some disadvantages like post operative infection, delayed healing and scar formation on extraoral site, difficult to perform in uncooperative patient or children or geriatric patients.

In surgery, tissue adhesives have been used to enhance wound healing, adhesion, and haemostasis. Collectively, these products fall into one of two categories: biologic or synthetic. In general, biologic glues fall into one of two categories: homologous or autologous. They are mostly fibrin adhesives. They have found widespread application as wound adhesion and internal tissue sealants. Autologous platelet adhesives may be more effective than fibrin glues at promoting wound healing[8].

To treat severe lacerations, bronchopleural fistulas, myocardial rips, mesh fixation for inguinal hernia surgery, cosmetic rhinoplasty, embolization of intracranial AV abnormalities, and CSF leaks, cyanoacrylates have been employed[9].

Adhesives play a very small role in oral and maxillofacial surgery; however, this is quickly changing. In 1949, Ardis discovered and manufactured chemical adhesives in 1949[5]. These tissue glues, which have been used to approximate skin, are mostly made from cyanoacrylate. When Coover finally disclosed their adhesive qualities in 1959, they were employed for the first time in humans[10,11]. With R standing for side chain, their usual formula is CNCH2=COO-R. Formaldehyde and a cyanoacrylate ester undergo reversible condensation to generate the monomer, which is what they belong to. In the presence of anions, particularly hydroxyl ions, these adhesives polymerize.

Mehta et al. Carried out one of the earliest investigations on the application of cyanoacrylate glue in dental procedures. The osteosynthesis of 10 mandibular fractures was carried out by the authors using butyl cyanoacrylate. They observed no negative side effects or chromosomal alterations in the patients throughout follow-up periods of one to six months[12].

The gene expression and mineralized tissue changes of autogenous grafts fixed with n-butyl-2-cyanoacrylate in the mandible of six rabbits were examined over a brief period of time (4–8 days) and contrasted with screw fixation. Advanced gamma-sterilized, nonpigmented, nontoxic, nonallergic, and biostatic tissue glue is isoamyl 2-cyanoacrylate. In addition to being easy to apply and exhibiting proven safety, it aids in quick wound closure with less scarring and lowers the risk of trauma and infection following surgery, resulting in efficient wound healing with little danger. In this study, tissue adhesives containing n-butyl-2-cyanoacrylate are used to compare the clinical healing, pain, and wound closure of intraoral wounds.

Qureshi A. et al[13] has shown that n-butyl-2-cyanoacrylate had bacteriostatic properties. Bhaskar et al. reported that local phagocytosis of butyl cyanoacrylate resulted in the formation of abscess and mild tissue necrosis[14]. Annabelle Rajaseharan

noted that neither n-butyl-2-cyanoacrylate nor isoamyl 2-cyanoacrylate tissue adhesives caused wound infections in any of his patients[15]. Rosin et al[16] revealed an instance of n-Butyl 2-cyanoacrylate-induced wound infection, which he linked to incorrect wound edge approximation.

When utilizing n-butyl-2-cyanoacrylate, the frequency of wound dehiscence has been reported in several investigations. Qureshi et al revealed two out of 102 instances of partial dehiscence during laparoscopic and general procedures, and he linked this occurrence to the insufficient drying of the skin's margins prior to the adhesive's application.

The findings of our study are consistent with that of Mehta et al[12], Qureshi A et al[13], Bhaskar et al[14], Annabelle Rajaseharan, Qureshi et al[14]; stating that cyanoacrylate is more favourable than silk suture in the intraoral closure of tissues in alveoloplasty.

CONCLUSION

Following alveoloplasty, wound closure can be effectively achieved using cyanoacrylate adhesive. In our study, when compared to silk suturing, the adhesive demonstrated superior haemostatic properties, reduced postoperative pain and swelling, and shortened operative time. Additionally, wound healing outcomes were more favourable with the adhesive than with conventional sutures.

The technique was also well-received by the operating surgeon. Owing to its bacteriostatic nature, cyanoacrylate offers added protection against wound infection. Other notable advantages include ease of application, faster procedure completion, and elimination of the need for a follow-up visit for suture removal. The primary drawback observed was the higher cost of the adhesive.

Further prospective research is warranted to confirm these findings and to evaluate the overall cost-effectiveness of tissue adhesives compared to surgical sutures, particularly in low-tension elective procedures. Nevertheless, our results indicate that cyanoacrylate adhesive is a superior alternative to traditional silk suturing for wound closure following alveoloplasty.

CONFLICT OF INTEREST: None

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