

A Comparative Study of N-Butyl Cyanoacrylate and Conventional Silk Sutures in the Closure of Intra Oral Incisions After Modified Corticotomy/Piezocision

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Abstract:-

➤ Background

Wound closure is assisted by the usage of appropriate suturing techniques and suture material in intra oral and general surgical procedures and aimed at maintaining form, function and aesthetics of surgical site. Wound closure can be done by suture materials, staples and tissue adhesives. Purpose of this study is to clinically compare the efficacy between tissue adhesive and standard suturing for wound closure after the piezocision.

➤ Aims & Objectives

Aim of the study was to compare the efficacy between tissue adhesive and standard suturing for wound closure after piezocision. The Objectives were to assess the surgical outcome of cyanoacrylate glue and conventional suture, and to compare surgical outcome of the both and also to establish an alternative to the conventional suture with emphasis on cost to benefit ratio.

➤ Materials and Methods

In this prospective, non-blinded study we have included 8 healthy consenting individuals of age group 16-30 years who were indicated to undergo piezocision/Modified corticotomy. Patients were divided into 2 groups. Group A in whom the wound closure was done with cyanoacrylate glue and Group B received interrupted routine conventional silk suture after wound closure.

➤ Results

The results were statistically significant and showed superior results in surgical glue group when compared with silk suture group for postoperative parameters.

➤ Conclusion

Cyanoacrylate is a better alternative for wound closures in minor oral surgical procedures as tissue glue was found to be haemostatic in nature, helpful in reduction of post operative pain and patients need to visit again for suture removal was not required. Moreover, this procedure was found to be comfortable for the surgeon. Future studies are required to evaluate long term results of intraoral usage to further its application. Research is needed for development of better tissue adhesives for usage in intraoral wounds.

Keywords:- *Piezocision, Cyanoacrylate Glue, Silk Suture, Intraoral Wound Closure, Piezosurgery.*

I. INTRODUCTION

Wound healing is a challenging clinical problem and correct, efficient wound management is essential to positively influence the wound healing course and reduce potential complication. The response of tissue to injury forms the foundation of surgical practice. Wound healing is a complex & dynamic process. A thorough knowledge of basics of physiology of wound healing is a must to implement the principles of wound closure.¹

The primary goals of wound closure are to stop bleeding, prevent infection, speed healing and achieving a functionally & aesthetically pleasing scar.²

The need for proper wound closure is of paramount importance after any intra oral surgery. Various wound closure techniques have been discussed in literature using traditional, synthetic absorbable & non-absorbable sutures, surgical staples & tissue adhesives. Cyanoacrylates are among the most commonly used tissue adhesives like methyl-2-cyanoacrylate, ethyl-2-cyanoacrylate, n-butyl cyanoacrylate and 2-octyl cyanoacrylate.

There are presently four types of tissue adhesives: fibrin sealants, collagen-based sealants, synthetic polymer-based materials, and protein-based sealants. Utilization of tissue adhesives can be divided in to three categories: haemostasis, tissue sealing and local delivery of exogenous substances⁶.

The emergence of Piezocision has influenced the efficiency, duration, cost and convenience of accelerated orthodontics dramatically. Piezocision is the flapless method of corticotomy using piezosurgery⁸ (Osteotomy using Piezo). It is believed that the rapid tooth movement after corticotomy (surgical procedure whereby only the cortical bone is cut, perforated or mechanically altered) surgery is due to elimination of the resistance of the cortical layer of bone and due to reparative process induced after the injury.⁹

This technique combines micro incisions limited to the buccal gingiva that allows the use of a piezoelectric knife to give osseous cuts to the buccal cortex and initiate the RAP without involving palatal or lingual cortex.¹² Presently in oral and maxillofacial surgery, adhesives have a minimal role, but this is changing rapidly. Thus, in view of the above-mentioned features, the purpose of this study is to compare between tissue adhesive and standard suturing for wound closure after piezocision.

➤ *Aims & Objectives*

The aim of this study was to compare and contrast the effects on healing of intraoral wounds when closure was carried out by n-Butyl cyanoacrylate and conventional silk suture.

The objective was to assess the surgical outcome of cyanoacrylate glue, the surgical outcome of conventional suture and also to compare the surgical outcome of both.

II. METHODOLOGY

In this prospective non-blinded comparative study between 3-0 black braided silk suture and n-butyl-2 cyanoacrylate glue. We have included 8 consenting individuals of age group 16-30 years who are undergoing orthodontic treatment at Coorg institute of dental sciences. Under standard aseptic conditions, the selective tunnelling (piezocision) procedure was carried out under local anaesthesia.

The intraoral wounds were divided into 2 groups which consisted of 8 patients: Group A and Group B. Group A with individual in whom incision closure was done with N-Butyl-2-Cyanoacrylate glue. Group B with individual in

whom incision closure was done with interrupted routine 3-0 black braided conventional Silk suture.

Healthy patients who required orthodontic treatment (accelerated orthodontic tooth movement) and patients with no history of periodontal infections/ bone loss in the required surgical site were included in the study. The exclusion criteria were patients with history of smoking, allergic to drugs or anesthetic agents used in surgical protocol, poor oral hygiene, patients lost to follow up, patients on oral contraceptives, patients under radiotherapy or chemotherapy, diabetic patient, patients on immunosuppressants, patients having a pacemaker or any other active implants, patients undergoing pregnancy.

All patients were advised to undergo routine haemogram before the procedure. Patients were prepared in a standard aseptic manner and taken up for the procedure under proper aseptic condition where in the patient is painted with 5% betadine intraorally and extraorally and draped. Patient was anaesthetized with 2% lignocaine with 1:80,000 adrenaline in infiltration manner on both labial & lingual sides of the required Piezocision region. Vertical incisions measuring 1cm in length were made using No:15 BP blade on the buccal aspect of the extracted teeth region where rapid orthodontic space closure was anticipated, interproximal buccal incisions are made in the attached gingiva or alveolar mucosa. The incisions are small enough to accommodate the diameter of the BS 1 insert of the piezotome. These incisions are started 2–3 mm below the base of the interproximal papillae, keeping in mind that the soft tissues and the underlying periosteum need to be cut to create an opening that will allow for the insertion of the BS 1 insert. Once the soft tissue incisions are completed, the piezotome is used to create the bone injury that will start the RAP (Regional accelerated phenomenon). This is done by inserting the head of the BS1 insert in the gingival openings and decorticate the alveolar bone. The depth of the cut is 3mm and care has to be taken so that the surrounding roots are not injured. Following the procedure, the cyanoacrylate glass ampoule inside the jacket was crushed and applied along the surface on to the incision for the wound closure in group A, where as in group B 3-0 black braided silk sutures was used in simple interrupted manner to close the wound. Patients were prescribed similar analgesics for 3 days and antibiotic for 5 days postoperatively. All procedures in the study were performed under the standard guidelines for the respective procedure. The patients were evaluated on immediate post-operative, 1st, 3rd and 7th post-operative day after the surgery.

Variables were taken as immediate post-operative bleeding, pain, wound dehiscence, wound healing & patients comfort on immediate post-operative day, 1st, 3rd & 7th post-operative day.

➤ *Postoperative Bleeding was Recorded as (Visual Analog Scale)¹³*

- No bleeding
- Oozing

- Accidental low bleeding
- Continuous low bleeding
- Massive bleeding.

➤ *Absence of Pain was Noted as 0 and 10 Expressed as Maximum Pain¹²*
Scoring criteria given as

- 0= absence of pain.
- 1= pain assessment less than 5;
- 2= pain assessment greater than 5.

Patients were given a subjective pain scale ranging from 0 to 10(visual analogue Scale-Wong baker scale). Rescue analgesics required beyond the third postoperative day would be recorded in both the groups.

➤ *It is Defined as Wound Rupture Along the Surgical Incision¹³.*

- 0=absence of wound rupture.
- 1=presence of wound rupture.

➤ *Wound Healing*
Scoring criteria was given as ¹³,

- Score 1- Healing is not satisfactory
- Score 2 - Healed adequately
- Score 3- Healing is satisfactory

Every patient was asked to compare and rate the postoperative comfort on the silk suture site as well as cyanoacrylate glue site. The scoring was given as 0-3 as

poor comfort, 4-7 as fair and 8-10 as good and the subjective review was taken on 7th day.

Patients who fell under poor comfort were categorized as 1, patients falling under fair were categorized as 2 and patients falling under good were categorized as 3.



Fig 1 3-0 Black Braided Silk Suture

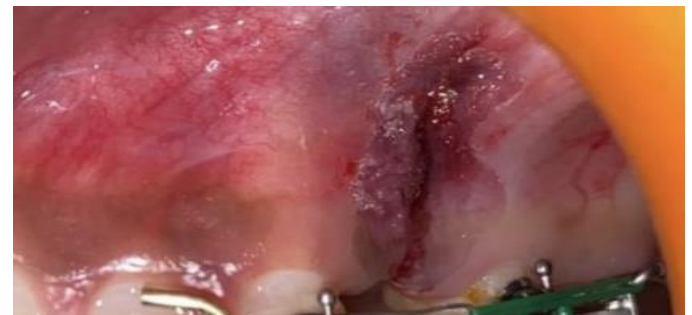


Fig 2 N-Butyl-2 Cyanoacrylate Glue

III. RESULTS

The patients were followed up on immediate after postoperative, 1st day, 3rd day, 7th for postoperative day for signs and symptoms of bleeding, pain, wound dehiscence and wound healing, time taken for the wound closure and post operative comfort of the patient. The age of the patients included in our study were between 16-30 years.

➤ *Postoperative Bleeding*

Comparison of postoperative bleeding in both group A and group B between immediate postoperative day, 1st postoperative day, 3rd postoperative day & 7th postoperative day is shown in table below.

Table 1 Comparison of postoperative bleeding in both group A and group B

	Scores	Timeline				Chi square value	Sig.
		Immediate	1 st day	3 rd day	7 th day		
Glue group	0	10(100)	10(100)	10(100)	10(100)	3.077	0.380(NS)
	1	0(0)	0(0)	0(0)	1(10)		
Suture group	0	6(60)	10(0)	10(100)	7(70)	25.920	0.000(HS)
	1	4(40)	0(0)	0(0)	3(30)		

Table 2 Comparison of Postoperative Bleeding in Both Group A And Group B

Hemostasis		0	1	Chi square value	Sig.
Immediate	Glue group	10(100)	0(0)	5	0.043(S)
	Suture B	6(60)	4(40)		
1 st day	Glue group	10(100)	0(0)	-	-
	Suture group	10(100)	0(0)		
3 rd day	Glue group	10(100)	0(0)	-	-
	Suture group	10(100)	0(0)		
7 th day	Glue group	10(0)	0(0)	1.250	0.291(NS)
	Suture group	7(70)	3(30)		

Bleeding was absent on immediate postoperative, 1st postoperative day & 3rd postoperative day. On the 7th postoperative day in cyanoacrylate group, where as in suture group bleeding was present in 4 out of 10 wounds during immediate postoperative phase, 0 out of 10 wounds during 1st and 3rd postoperative day. 3 out of 10 wounds had mild ooze on the day of suture removal (7th follow up day) in the silk suture group.

➤ Pain

Pain was assessed by Visual analogue scale (WONG-BAKER SCALE), In Glue group the pain was absent in immediate postoperative and 1st postoperative day. On 3rd postoperative day 4 wounds out of 10 had a mildly annoying pain with a score of <5. By the 7th postoperative day 2 out of 10 wounds had mild pain with a score of <5.

In Suture group the pain was absent in all 10 wounds during immediate postoperative day. On 1st post-operative day 4 out of 10 had mild annoying pain on 3rd post-operative day, 2 out of 10 had mild pain and by the end of 7th follow up day 1 out of 10 sutures wounds had nagging uncomfortable pain with a score of <5.

➤ Wound Dehiscence

Table 3 Comparison of wound dehiscence between Group A and Group B

Glue group	Scores	Immediate Post op	1 st day	3 rd day	7 th day	Chi square value	Sig.
	0	10(100)	10(100)	10(100)	9(90)		
	1	0(0)	0(0)	0(0)	1(10)		
Suture group	0	10(100)	10(100)	10(100)	8(80)	6.316	0.097(NS)
	1	0(0)	0(0)	0(0)	2(20)		
Wound dehiscence		0	1		Chi square value		Sig.
Immediate	Glue group	10(100)	0(0)		-	-	-
	Suture group	10(100)	0(0)				
1 st day	Glue group	10(100)	0(0)		-	-	-
	Suture group	10(100)	0(0)				
3 rd day	Glue group	10(100)	0(0)		-	-	-
	Suture group	10(100)	0(0)				
7 th day	Glue group	9(90)	1(10)		0.392	0.50(NS)	
	Suture group	8(80)	2(20)				

• Comparison of Wound Dehiscence Between Group A And Group B

Wound dehiscence was absent during immediate, 1st, & 3rd day post-operative follow up days and on 7th day post-operative day 9 out of 10 wounds had no wound dehiscence in the cyanoacrylate Group. In the Suture group there was no wound dehiscence on immediate, 1st & 3rd post operative follow up day. On 7th post-operative day 2 out of 10 wounds had wound dehiscence.

➤ *Wound Healing*

Table 4 Comparison of wound healing between Group A and Group B

		Glue Group	Suture Group	Chi Square Value	Sig.
Wound healing 7 th day	1	0(0)	2(20)	20.000	0.000(HS)
	2	0(00)	8(80)		
	3	10(100)	0(0)		

By the end of 7th day wound healing was assessed in the wounds of both the groups. Healing was satisfactory in 10 out of 10 wounds in Cyanoacrylate group. Healing was not satisfactory in 2 out of 10 wounds and was adequate in 8 out of 10 wounds in Silk suture group.

Table 5 Intra Operative Assessment of Duration of Procedure

Time taken for wound closure in seconds	Mean	Standard deviation	t	Sig.
Group A	156.8000	4.63801	-67.705	0.000(HS)
Group B	318.6000	5.96657		

The mean time taken for the wound closure in Glue group is 156 seconds and for Suture group it is 318 seconds with a standard deviation of 4.6 in Glue group and 5.9 in Suture group.

• *Postoperative Comfort*

All the patients were asked to assess how comfortable the wound closure was by the end of 7th day, All the wounds in the Suture group were falling under fair comfort where as patients wounds in the Glue group were falling under Good comfort. The postoperative comfort is described in the table below.

Table 6 Postoperative comfort of both Group A & B

		Glue group	Suture group	Chi square value	Sig.
Post op comfort 7 th day	1	0(0)	0(0)	20.000	0.000(HS)
	2	0(0)	10(100)		
	3	10(100)	0(0)		

IV. DISCUSSION

The healing wound is an over expression of an intricate and tightly choreographed sequence of cellular and biochemical responses directed towards restoring tissue integrity and functional capacity following injury. Although healing culminates uneventfully in most instances, a variety of intrinsic and extrinsic factors can impede or facilitate the process.¹⁷ Ideal wound healing largely depends upon use of proper surgical techniques and wound care. Good wound healing can be achieved by accurate incision, delicate tissue handling, precise wound approximation, good working properties of wound closure material and aseptic techniques to prevent pathogenic microbes from entering the body. Various other factors responsible for proper wound healing are person's systemic health, nutritional status, immune response and presence or absence of infection at the surgical site.⁴⁰

Soft tissue wound generally heals in three ways that is by primary intention, secondary intention and tertiary intention. Healing by primary intention is preferable as there is less scarring and the healing is rapid.⁴

The primary steps in the management of surgical wounds are to attain adequate hemostasis and tissue approximation. Through ages surgeons have used various materials to close incisions. They are metal clips, adhesive tapes and various suture materials. Every material has its

own advantages and shortcomings. A never-ending search for a material to overcome the shortcomings of the wound closure techniques led to the discovery of various new biomaterials like staples, adhesive tapes, adhesive glue and fibrin sealant⁴²

Cosmetic appearance and primary healing is often the final parameter by which outcomes in wound repair are judged. Optimal wound healing will be best obtained when wound edges are well apposed with proper eversion. Wound closure techniques have evolved from the earliest development of suturing materials to resources that include synthetic absorbable sutures, staples, and adhesive compounds¹⁶

Braided silk is the most common and widely used suture material for closure of oral wounds³¹ since 131 -211 BC, first introduced by Galen of Pergamon to repair damaged tendons in gladiators. Various studies of closure of oral wounds have been documented, reporting advantages such as careful closure, low dehiscence rate, resilient tensile strength and optimum handling properties. However, disadvantages like prolonged duration of surgery and anesthesia, maximal tissue reactivity (Posthelwaite1974), risk of needle-stick injury, undesirable trauma to intact tissue on either side of the wound, permanent suture tracts, pain and anxiety during removal have been reported.⁴³

Another significant disadvantage reported is the phenomenon of 'wicking', which makes it a site for retention and ingress of bacteria into the tissues and thus a reservoir of secondary infection. So in order to overcome these difficulties, a need for an alternative was always felt.⁴⁴

The ever striving search for an alternative procedure and materials has led to the discovery and development of tissue adhesives⁴⁵ to overcome the disadvantages of suture and provide sufficient good wound healing.

Surgeons have been using tissue sealants and adhesives since the early nineteenth century. There are presently four types of tissue adhesives: fibrin sealants, collagen based sealants, synthetic polymer-based materials and protein-based sealants. The creation of natural glues, surgical staples and tapes to substitute sutures has supplemented the armamentarium of wound closure techniques. The use of tissue adhesive has long appealed to surgeons and they have been extensively studied for diverse applications such as wound closure on extraction sockets, face, sinus perforations in sinus lift, mucogingival flaps, biopsy, and other sites in general surgery like axilla, lungs, hearts, scalp wounds, circumcision and perineum, trocar sites, cleft lip repair, face lifts, blepharoplasty, brow lifts and other cosmetic surgeries.²⁹

Cyanoacrylates were first described in 1949 and their first reported use as clinical adhesives was 10 years later by Coover³⁶. Members of the cyanoacrylate family include methyl, ethyl, propyl, butyl, hexyl, heptyl and octyl cyanoacrylates¹⁵. In 1960s, the combination of fibrin and thrombin as fibrin sealants were developed and used extensively with donor preserved and autologous donated plasma as the source of coagulation components. In 1977 however, the US Food and Drug Administration (FDA) revoked the license for commercial use of fibrin sealants from donor preserved human plasma.

Since 1980 n butyl 2-cyanoacrylate has been approved as alternative for skin closure at low tension areas. Its toxic effects and carcinogenicity were also studied and shown to be harmless^{23,28,3}

Mehta et al reported that the use of n-butyl-2-cyanoacrylate adhesives in the surgical treatment of fractures seems very promising and he stated that n-butyl-2-cyanoacrylate was nontoxic, non-mutagenic and non-carcinogenic. In some studies²⁷ by using agar overlay tissue cultures it has been shown that fibroblast cell death around a disc of n-butyl-2-cyanoacrylate progressed at a slow rate indicating its moderate toxicity on fibroblasts in vitro. Clinical and electron microscopic examination in this study has not revealed any evidence of that sort.

Presently in oral and maxillofacial surgery, adhesives have a minimal role, but this is changing rapidly. Despite the improvement in chemistry of cyanoacrylates, there have been a number of clinical studies in literature regarding the intraoral use of cyanoacrylates. Hence taking the various advantages into consideration, a need to study the use of

cyanoacrylate glue should be considered. Hence this study was undertaken to compare the efficacy between tissue adhesive and standard suturing for wound closure after peizocision.

In this prospective, comparative study we have included 8 consenting individuals of age group 16-30 years who were indicated to undergo Peizocision / modified corticotomy. Two groups (A & B) consisting of 10 wounds each were considered. Group A (Glue group) where the wound closure was done with cyanoacrylate glue and Group B (Suture group) the wound closure was done with conventional silk suture for wound closure after peizocision.

The study objectives were to assess the surgical outcome of cyanoacrylate glue and conventional suture with regards to the postoperative bleeding, severity of pain, wound healing, wound dehiscence, time taken for wound closure and postoperative comfort / quality of life of the patient and also to establish an alternative to the conventional silk suture. The severity of pain, bleeding, wound healing and wound dehiscence are the indicator of a patient's comfort during the postoperative period.

Piezosurgery is a minimally invasive and selectively cutting instrument that inert to surrounding soft tissues and important structures such as nerves, vessels and mucosa. It was developed by Italian oral surgeon Tomaso Vercellotti in 1988 to overcome the limits of traditional instrumentation in oral bone surgery by modifying and improving conventional ultrasound technology. Piezocision is the flapless method of corticotomy using piezosurgery (Osteotomy using Piezo). It is believed that the rapid tooth movement after corticotomy (surgical procedure whereby only the cortical bone is cut, perforated or mechanically altered) surgery is due to elimination of the resistance of the cortical layer of bone and due to reparative process induced after the injury.

Regarding bleeding, the surgical glue group was found to be significantly superior. During immediate postoperative phase, there was no bleeding in all 10 wounds (100%) of group A and in 6 wounds (60%) of group B and this was found to be significant with p value < 0.043. By the end of 7th day mild ooze was found in the 30% of the wounds among silk sutured group B on removing the sutures which was eventually controlled by pressure application. Whereas, the ooze was absent in 100 % of the wounds among the glue group A on the 7th follow up day. Our results are similar to Mehdi Ghoreishian et al, Sneha Setiya et al, Ajit D. Joshi et al. The slow biodegradation nature of cyanoacrylate into formaldehyde and cyanoacetate makes the material less histotoxic²². Hence, resulting in fewer toxic by-products released into the tissues per unit time. This slower release allows for more efficient tissue clearance of these toxic by-products, with less ensuing tissue toxicity. The rate of degradation is inversely proportional to the side-chain length and correlated directly with the degree of local inflammation and tissue toxicity. Hence, resulting in fewer toxic by-products released into the tissues per unit time. This slower release allows for more efficient tissue clearance of these toxic by-products, with less ensuing tissue toxicity. The rate

of degradation is inversely proportional to the side-chain length and correlated directly with the degree of local inflammation and tissue toxicity. Higher homologues hypothesis is that the ester forms a macrofilm causing mechanical blockage to slow blood flow, providing a surface agent to activate the clotting cascade³⁵. This could be explained as cyanoacrylate has been found to be an excellent haemostatic agent. Bleeding is generally adequately retarded within fifteen seconds after application and a second dose is seldom required²⁰

Pain after any surgery is expected to be one of the inevitable morbidity. The postsurgical pain begins when the effect of the local anaesthesia subsides and reaches peak levels in 6 to 12 hours.

Pain was assessed by Visual analogue scale (WONG-BAKER SCALE), In Glue group the pain was absent in immediate postoperative and 1st postoperative day. On 3rd postoperative day 4 wounds out of 10 had a mildly annoying pain with a score of <5. By the 7th postoperative day 2 out of 10 wounds had mild pain with a score of <5 with a p value of 0.035 which is non-significant.

In Suture group the pain was absent in all 10 wounds during immediate postoperative day. On 1st post-operative day 4 out of 10 had mild annoying pain on 3rd post-operative day 2 out of 10 had mild pain and by the end of 7th follow up day 1 out of 10 sutures wounds had nagging uncomfortable pain with a score of <5. This was found to be highly significant with p value of <0.109.

Immediate postoperative, 1st, 3rd & 7th day postoperative results were significant in Group A could be because of the analgesics effect. More number of patients of group B had mild pain even after the cessation of analgesics. Subsequently none of the patients reported with any pain after the 7 days follow up.

Our results are similar to Mehdi Ghoreishian et al⁶ Sneha Setiya et al³³ and Ajit D. Joshi et al²⁸ Kulkarni et al¹⁹ found reduced post-operative pain after the use of cyanoacrylate in periodontal flap surgery. V Rajkumar et al²⁷ concluded that tissue adhesives cause less pain as compared to sutures. This may be due to less tissue handling and less tissue inflammation in the study group. Similarly, the results of our study showed marked significant difference in the severity of pain in both the groups for immediate postoperative, 1st, 3rd and 7th day postoperative follow up for pain evaluation.

In the present study we have also assessed wound dehiscence and wound healing. Optimal wound healing will be best obtained when wound edges are well apposed with proper eversion. Ideal wound healing largely depends upon use of proper surgical techniques and wound care. Good wound healing can be achieved by accurate incision, delicate tissue handling, precise wound approximation, good working properties of wound closure materials and aseptic techniques to prevent pathogenic microbes from entering the body. Various other factors responsible for proper wound

healing are patient's systemic health condition, nutritional status, immune response and presence or absence of infection at the surgical site.

Wound dehiscence was absent during immediate, 1st, & 3rd day post-operative follow up days and on 7th day post-operative day 9 out of 10 wounds had no wound dehiscence in the cyanoacrylate Group. In the Suture group there was no wound dehiscence on immediate, 1st & 3rd post operative follow up day. On 7th post-operative day 2 out of 10 wounds had wound dehiscence with a p value of <0.50.

By the end of 7th follow up day wound healing was assessed in both the group A & B. Healing was satisfactory among 10 out of 10 wounds in Group A (Cyanoacrylate glue). Healing was adequate in 8 out of 10 wounds & was not satisfactory in 2 out of 10 wounds in Group B (Silk suture group), with a p value of <0.000 which was highly significant.

Our study showed satisfactory healing which is similar to the study conducted by Mehdi Ghoreishian et al⁶, Sneha Setiya et al³³, Ajit D. Joshi et al²⁸. A study done by RJ Mortan et al⁴ on 50 scalp wounds which were treated with adhesive. At review, only one wound had failed to achieve complete healing. Patient acceptability was high and the procedure rapidly gained popularity amongst the clinical staff. They concluded that adhesive should be considered as an alternative to suturing small scalp wounds.

The time taken for the wound closure is very crucial parameter to be considered. Our study also recorded the time taken for wound closure in both the groups. The mean time taken for the wound closure in Group A is 156 seconds and for Group B it was 318 seconds with a standard deviation of 4.6 in Group A and 5.9 in Group B. The results were similar to a study conducted by phani himaja et al³⁹, where they compared the cyanoacrylate tissue adhesive and silk sutures in intra oral wound closure and concluded that the glue group takes lesser time for wound closure than closure by the silk sutures and lesser time to achieve haemostasis.

The postoperative patients comfort was also assessed in this study All the patients were asked to assess whether and how comfortable they were on both the tissue adhesive site and sutured site during the 7th follow up day. All the wounds in the sutured group were falling under fair comfort where as patients wounds in the glue group were falling under Good comfort with a p value of < 0.000 . The subjective response indicated that those patients in whom wound closure done with cyanoacrylate glue i.e., group A were more comfortable than in whom wound closure done with conventional silk suture technique i.e., group B.

Cyanoacrylate tissue adhesives form a strong bond across tissue-wound edges by secondary intermolecular forces such as hydrogen bonding aided by mechanical interlocking of irregular and porous surfaces²² enabling normal healing to occur below the seal. These adhesives have been shown to save time and provide a flexible water

resistant protective coating that will seal wounds from water exposure and contamination. They can be used safely in small wounds, but also in larger wounds where subcutaneous sutures are needed and a watertight sealant is appropriate.

Favourable characteristics of cyanoacrylates are that it offers several advantages over other methods of wound closure and tissue fixation like their ability to rapidly form a flexible hydrogen bond, act as an occlusive protective dressing, decrease inflammation and reduce follow-up care and medical costs.

One of the more alluring features of cyanoacrylates is their ease of application. For example, repair of lacerations and surgical incisions require significantly less time when using these polymers. Cyanoacrylate surgical sealant has some characteristics that make it particularly useful and reliable for the surgeon. It can be stored at room temperature can be easily and rapidly prepared in the applicator device, and is easy to apply³⁸.

Our study showed patients had less pain, good haemostasis, satisfactory wound healing and atraumatic wound closure, less time taken for the wound closure and better postoperative patient comfort in the n-butyl-2-cyanoacrylate group as compared to suture group and our results have same findings as Mehdi Ghoreishian et al⁶ Sneha Setiya³³ et al²⁶ and Ajit D²⁸. Joshi et al. Although patients didn't have opportunity to experience both wound closure techniques in order to explain relative comfort, their subjective response indicated that those patients in whom wound closure done with cyanoacrylate glue i.e., group A were more comfortable than in whom wound closure done with conventional silk suture technique i.e., group B.

This study clinically compared N-butyl-2-cyanoacrylate with silk suture for closure of intraoral wounds. Postoperative parameters like bleeding and pain, haemostasis, better postoperative comfort, time taken for wound closure and wound healing had superior results for surgical glue group patients. The ease of application, less time consumption, no food lodgement & irritation²⁸ to the patient compared to conventional sutures and better patient acceptability makes cyanoacrylate more advantageous over silk sutures. Hence, it can be concluded that cyanoacrylate is a better alternative for intraoral minor surgical procedures as tissue glue, as it was found to be haemostatic in nature, was helpful in reduction of pain and patients need to visit again for suture removal was not required. Moreover, this procedure was found to be comfortable for the surgeon.

The cost of tissue adhesive was the limitation of this study. Future studies are required to evaluate long term results of intraoral usage to further its application. Research is needed for development of better tissue adhesives for usage in intraoral wounds.

V. CONCLUSION

Closure of soft tissue wounds of maxillofacial region are primarily achieved by mechanical devices, such as sutures and staples. Tissue adhesive for wound closure is an emerging technology with innovative concepts and cutting-edge applications. Presently in oral and maxillofacial surgery, adhesives have a minimal role, but this is changing rapidly.

Conventionally, ideal wound closure is achieved by suture material but because of namely prolonged duration of surgery and anaesthesia, tissue reactivity, risk of needle stick, undesirable trauma to the intact tissue on either side of wound, permanent suture tracts, early removal or suture snapping results in dehiscence, anxiety and pain during removal and inadequate aesthetics effect resulted in the evolution of alternative procedures for wound closure, that is tissue adhesive. The best tissue adhesive material is N-Butyl 2-cyanoacrylate, which is easy to apply, reduce the anxiety of the patient. It also acts as a haemostatic agent and antimicrobial agent.

Older cyanoacrylates like methyl-and ethyl-cyanoacrylates are not biodegradable and can induce significant inflammatory response, they are also hydrophobic in nature. These properties did not permit the usage of such adhesives in intraoral wounds. With the advent of n-butyl cyanoacrylate, closures of moisture contaminated wounds like intraoral wounds are possible. It has also been found that moisture promotes polymerization reaction. N-butyl-2-cyanoacrylate has biodegradable properties and induces lesser tissue inflammation compared to older adhesive system.

Our study clinically compared n-butyl 2-cyanoacrylate with silk suture for closure of intraoral wounds. Parameters like bleeding, pain, wound dehiscence, and wound healing, time taken for wound closure and patient's post operative comfort were evaluated subjectively.

In this prospective, comparative study we have included 8 healthy consenting individuals of age group 16-30 years who were indicated to undergo peizocision. Intra oral wounds were divided into 2 groups consisting of 10 each. Group A the wound closure was done with cyanoacrylate glue and Group B it was done using routine conventional silk suture.

Postoperative parameters like bleeding and pain, Patient comfort/quality of life after procedure and intraoperative parameters like time taken for wound closure had superior results for glue group A patients. The evaluated wound dehiscence and wound healing were found to have superior results in the same glue group A.

Ease of application, less time consumption, no food lodgement & irritation to the patient compared to conventional sutures and better patient acceptability makes cyanoacrylate more advantageous over silk sutures. Hence, it can be concluded that cyanoacrylate is a better alternative

for intraoral minor surgical procedures as tissue glue, as it was found to be haemostatic in nature, was helpful in reduction of pain and patients need to visit again for suture removal was not required. Moreover, this procedure was found to be comfortable for the surgeon.

The small sample size, possibility of complications other than pain, wound dehiscence, shorter period of follow up, absence of an objective measurement technique and the cost of tissue adhesive were limitations of the study. Future studies are required to evaluate long term results of intraoral usage to further its application. Research is needed for development of better tissue adhesives for usage in intraoral wounds.

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