

HEALING OF ORAL SURGICAL WOUNDS USING 3/0 SILK SUTURE AND N-BUTYL CYANOACRYLATE TISSUE ADHESIVE

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ABSTRACT

Objective: Comparing two different materials for wound closure: 3-0 silk suture and tissue adhesive N-butyl-2-cyanoacrylate in intra-oral surgical incisions closure.

Patients and Methods: Twenty patients attended the Oral and Maxillofacial Surgery Clinics, College of Dentistry, King Saud University were randomly divided into two equal groups according to the material used for wound closure. *Group I (suture group):* comprised 10 patients where incisions were closed using 3/0 black silk suture. *Group II (cyanoacrylate group):* comprised 10 patients where incisions were closed using synthetic cyanoacrylic surgical glue (Glubran 2).

Results: The use of Glubran 2 showed a better intimate healing with no gaps compared to using silk suture. Discomfort and irritation scores for silk suture and the Glubran 2 sites were statistically significant ($P < 0.05$).

Conclusion: The use of (Glubran 2) in closure of intra-oral surgical incisions is an easy and effective way in managing intraoral wounds. It greatly reduces the patient psychological stress and anxiety during suturing, plus eliminating the possibility of self injury but the material relative high cost should be taken in consideration.

KEY WORDS: Silk suture, tissue adhesive, cyanoacrylate, wound closure

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INTRODUCTION

Surgical sutures have been used for a long time for approximating wound margins. But tissue incompatibility of the suture material may give rise to foreign body reaction and granulations which may result in fistulisation. Also tight sutures may cause tissue ischemia and necrosis (Matras, 1985). These factors are more important in patients with compromised healing (Yucel et al, 2003).

Braided silk is the most common suture used for closure of oral wounds. It has 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. It has been found that silk has the maximum amount of inflammatory tissue response (Posthelwaite, 1974). So, in order to overcome these difficulties, a need for alternatives to sutures is always felt (Levin, 1980 and Sachs et al, 1984).

Cyanoacrylates are tissue-adhesive materials that were synthesized in 1959 by Coover et al. The cyanoacrylate material has a chemical formula $H_2C = C(CN)COOR$, where R-can be substituted for any alkyl group ranging from methyl to decyl. The earlier methyl homologues were found to be histotoxic and thus were discontinued in clinical practice (McGraw and Caffess, 1978, Levin, 1980, and Herod, 1990). N-butyl cyanoacrylate (NBC) is a biocompatible tissue adhesive and is hence used for closure of wounds (Kulkarni et al, 2007).

According to Coulthard et al (2002), tissue adhesives offer the advantages that there are no sutures to be removed later for the patient and no risk of needle-stick injury to the surgeon.

In this study, we compared wound closure using 3/0 black silk suture or Glubran 2 tissue adhesives in intra-oral surgical incisions closure until complete wound healing is clinically evident. The advantages and disadvantages of each material were recorded in order to determine the most suitable one.

PATIENTS AND METHODS

Twenty patients who attended the Oral and Maxillofacial Surgery Outpatient Clinics, College of Dentistry, King Saud University, were included in this study. The trial protocol was approved by the college's ethics committee and informed consents were obtained from all patients. Those patients were randomly divided into two equal groups according to the material used in incision closure.

Group I (suture group): comprised 10 patients where incision closure accomplished using 3/0 black silk suture.

Group II (cyanoacrylate group): comprised 10 patients where closure accomplished using synthetic cyanoacrylic surgical glue (Glubran 2, GEM S.R.I. Italy).

The criteria of patient selection were: adult patients (20-40 yrs), with no history of systemic and/or local diseases, with good oral hygiene, and non-smokers. Any intra-oral incision site with nearly symmetrical length and design was used in this study for comparing the two different tissue closing materials during the healing period. The different materials were applied during incision closure and the following parameters were noticed and recorded for comparison: 1- During the application; length of time of application, occurrence of needle stick injury in case of suturing and surgeon's satisfaction. 2- During the healing period; presence of wound dehiscence, infection, scar formation, and patient general satisfaction (pain or irritation from the material). Finally, the relative cost of the material was considered in this comparison.

A visual analog scale from 0 to 10 centimeters was also used to subjectively assess the pain, irritation, or discomfort after surgery. Patients were followed up weekly for 4 weeks until complete healing of the surgical site. The results were obtained and the data was collected and statistically analyzed.



Fig. (1) The cyanoacrylate material package used in the study.



Fig. (2) The disposable syringe and ampoule used to apply the material.

RESULTS

Twenty patients were included in this study. There were 9 males and 11 females, their ages ranged from 20-38 years (mean 25 years). In the comparative analysis done between the suture and the cyanoacrylate (Glubran 2®) sites, the following results were obtained.

Glubran 2 showed easier way of handling than silk suture especially in difficult access areas. There

was no incidence of needle stick injury to the surgeon when using the silk suture. Wound closure time was faster in case of Glubran 2 and better healing noticed 6 days after the initial assessment of the surgical sites. In case of silk suture some areas were still open and no complete healing of the incisions was noticed. Food adhesion to the surgical suture was also noticed compared to a clean surgical line in case of tissue adhesive but no cases of infection were recorded in both groups. The difference in discomfort and irritation scores of the suture and the cyanoacrylate sites was statistically significant ($P < 0.05$), while the difference in pain scores was not statistically significant as shown in Table 1. The surgeon was completely satisfied by using this tissue adhesive material regarding the time and ease of application.

No cases of healing complications were recorded in both groups and the healing course during the 4 weeks of follow up was uneventful. The patients also were completely satisfied by using this material instead of suturing regarding the irritation sensation or perception.

TABLE (1) The difference in pain, discomfort and irritation scores between suture and tissue adhesive

| | T-TEST | P VALUE |
|------------|--------|---------|
| PAIN | 1.101 | 0.336 |
| DISCOMFORT | 2.784 | 0.019 |
| IRRITATION | 2.349 | 0.048 |



Fig. (3-A) An incision in the lower Lt wisdom tooth region before closure using cyanoacrylate (Glubran 2).



Fig. (3-B) One week follow up after incision closure.



Fig. (3-C) Two weeks follow up after incision closure, showing complete healing.



Fig. (3-D) Four weeks follow up after incision closure using Glubran 2.



Fig. (4-A) An incision in the upper Rt 2nd premolar area before closure using cyanoacrylate (Glubran 2).



Fig. (4-B) Four weeks follow up after wound closure.



Fig. (5-A) An incision in the upper left wisdom tooth area before closure using cyanoacrylate (Glubran 2).



Fig. (5-B) Four weeks follow up after wound closure, showing complete healing.

DISCUSSION

Traditional methods of surgical incision closure have been used for many years. However, these techniques are not without some problems and it is therefore important to consider new development that may offer advantages for the patient. The most common device for incision closure is the suture (Coulthard, 2008). The present study was carried out to evaluate the clinical healing of the intra-oral incision sites after closure with silk suture or cyanoacrylate (Glubran 2) and also the difference in their application during the incision closure procedure. Cyanoacrylate is a biocompatible tissue adhesive and has good working properties like flow and fast setting. Cyanoacrylate is a good haemostatic agent. It has good bonding properties and strength to hold tissue margins together (McGraw and Gaffesse, 1978 and Greer, 1975).

In our study, the pain scores of the suture and the cyanoacrylate sites were not statistically different. This is attributed to the profound local anesthesia given to the patients and the sympathetic psychological management. But there was a clear discomfort and irritation as stated by all patients in the presence of suture material.

The surgical site infection was considered to be present if any of the following were observed; swelling, purulent discharge, pain, increased skin temperature, or fever or other systemic signs of infection. No cases of infection or dehiscence were recorded in this study. The absence of these complications of wound healing seems to be partially related to strict adherence to antiseptic surgical techniques and prophylactic prescription of antibiotics, and to the patient compliance with postoperative instructions and maintenance of a good oral hygiene.

Patient satisfaction is also important when comparing alternative incision closure devices providing that the primary efficacy variable of dehiscence, infection and cosmetic appearance are satisfactory. Patient satisfaction may include rating for cosmeses, overall comfort, tension in wound, hygiene problems or allergic reaction, and overall satisfaction. A further important factor that might be expected to favor tissue adhesive is the lack of requirement for its removal (Coulthard 2008). In this study, patient satisfaction was more obvious when using cyanoacrylate rather than suture, because of lack of requirement for its removal and less irritation during healing than suture. These findings are in

conjunction with those reported by Greene (1999) and Shamiyeh (2001).

Certainly, there is no risk of needle stick injury to the surgeon when using cyanoacrylate rather than suture. In our study, the closure time was similar when using both materials. This finding is similar to those described in a review of tissue adhesives for closure of surgical incisions (2008) in which Coulthard et al, stated that: in practice, the reduction in wound closure time may not be great enough to permit greater number of operations in a given operating room time available. However, patients may be happy with a lengthier closure time for a technique with superior outcome.

Generally, tissue adhesives cost more than suture for incision closure. An ampoule of adhesive may be three times or more the cost of a suture required to close an incision of the same length (Coulthard et al, 2008). This statement is also true in our study which revealed that the only disadvantage of (Glubran 2) is its cost in comparison to black silk sutures (about 5 folds) which should be kept in mind before its use.

CONCLUSION

The use of N-butyl Cyanoacrylate (Glubran 2) in closure of intra-oral surgical incisions is an easy and effective way in tissue adhesion. The wound healing is not different from using suturing but with better clean margins. On the other hand, it greatly reduces the patient psychological stress and anxiety during suturing, plus eliminating the possibility of needle stick self injury. The only disadvantage of this material is its high cost in comparison to black silk sutures (about 5 folds) which should be kept in mind before its use.

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