

Comparison of outcome of Cyanoacrylate Glue versus Suturing for facial wound closure

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Abstract

Introduction: Suturing is an important aspect of surgery since ages. Since time immemorial, surgeons have strived to produce invisible scars. Hence an attempt is made in this study to compare the outcome of facial wound closure between cyanoacrylate glue and suturing.

Methods: A prospective randomized comparative study involving 100 patients with clean fresh cut lacerated wound over face were included in the study. All the participants were randomly distributed into two groups: group 1(suturing) and 2(cyanoacrylate glue) by using sequential identical sealed opaque envelopes. Outcomes were compared between the 2 groups by assessing the wound at day 7 and day 56 by using the Hollander Wound Evaluation Scale and 10 point VAS (Visual analog scale) scoring system.

Results: Out of the 100 patients 76 were males and 24 were females. On the 7th day follow up, one patient in group 2 had wound dehiscence on the forehead region. Five patients in group 1 and 3 patients in group 2 had the wound infection. The VAS score done for cosmetic assessment at week 8 between the 2 groups was not statistically significant.

Conclusion: The cyanoacrylate tissue adhesive is a viable alternative in areas such as the head, neck and face where a dressing is unsightly or difficult to apply.

Key words: Cyanoacrylate glue, Suturing, VAS score

Introduction

Suturing is an important aspect of surgery since ages. Since time immemorial, surgeons have strived to produce invisible scars. This, however, has always been elusive. The ideal method of laceration and incision closure should be simple, safe, rapid, inexpensive, painless, bactericidal, and result in optimal cosmetic appearance of the scar. Wound closure techniques have evolved from the earliest development of suturing materials to resources that include synthetic absorbable sutures, staples, tapes, and adhesive compounds. Surgical sutures have been in use since the time immemorial and various materials ranging from human hair to the presently used silk sutures have been tried in the process of achieving a hassle free closure of wounds, but in spite of sophisticated suture materials and techniques there are occasions when the wound closure is not up to the

intended level and may present with complications like fistulation and granuloma formation, which results mainly due to incompatibility of suture materials. The creation of natural glues, surgical staples and tapes to substitute sutures has supplemented the armamentarium of wound closure techniques. The introduction of tissue adhesives heralded the era of suture free closures which led to better results. Sutures, on the other hand, have drawbacks such as plaque management issues, increased postoperative pain, increased tissue reactivity, and a higher infection risk^[1]. These limitations have prompted researchers to look for alternative approaches, including suture-less techniques. The cyanoacrylate tissue adhesives offer many of these characteristics. Developed in 1949, the cyanoacrylate adhesives are applied topically to the outermost skin layer. The cyanoacrylates are supplied as monomers in a liquid form. On contact

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with tissue anions, they polymerize forming a strong bond that holds the apposed wound edges together. The cyanoacrylate adhesives usually slough off with wound re-epithelialization within 5–10 days and do not require removal^[2]. When compared to sutures, it has benefits such as better plaque control, less postoperative pain, lower infection rates, faster healing, no special expertise required for application, and improved aesthetics^[3]. It is atraumatic and less time-consuming with better postoperative healing^[4,5].

Material and methods

One hundred patients were selected (sample size based on previous study)^[4] with clean fresh wound on the face including periorbital region. Duration of study was 6 months. Patients with any known systemic diseases and/or drug therapy that may interfere with wound healing, drug allergies to any of the drugs used in, were excluded. Wounds located at the vermilion border of the lip, the mucosa, or in areas covered by natural hair (precluding an assessment of cosmetic outcome at 2 months) were excluded. The research was performed in accordance with the Helsinki Declaration of 1975, as amended in 2013.

Surgical procedure: All the participants were randomly distributed into two groups : group 1 and 2 by using sequential identical sealed opaque envelopes. Treatment includes suturing or cyanoacrylate glue application after washing the wound with sterile normal saline under oral antibiotic coverage of amoxicillin and clavulanic acid for 3 days. Subjects were reviewed at day 0,7 and 56. In Group 1 wound was sutured with proline 5-0 cutting needle. In Group 2 wound was sutured with commercially available cyanoacrylate glue.

Parameters assessed & tests performed

Assessment of cosmetic appearance based on the Hollander Wound Evaluation Scale and 10 point visual analog score assessment on day 7 and day 56 was done by the Surgeon (who was blinded to the method of wound closure). A Surgeon assessed the wound using the Hollander Wound Evaluation Scale and 10 point VAS scoring system with 0 as worst possible scar and 10 for best possible scar. These assessments were done at one week and 8 weeks post-surgery. Parental satisfaction was also assessed with 5 point Likert scale where 5 denotes very satisfied, 4-satisfied, 3-neutral, 2-dissatisfied, 1-very dissatisfied, adverse reaction and allergy are recorded. Cost effectiveness of the both treatment modality was also calculated.

Table-1 Modified Hollander Scale

Incision attribute	Score if present	Score if absent
1. Step off borders	1	0
2. Contour irregularities	1	0
3. Margin separation	1	0
4. Edge inversion	1	0
5. Excessive distortion	1	0
6. Overall appearance	1	0

Results

A total of 100 patients were included and divided into two groups. Group 1 consisted of patients where wounds were closed using sutures. Cyanoacrylate glue was used for closure in Group 2 patients. First postoperative evaluation was done immediately. Second postoperative evaluation was done on 7th postoperative day (after 1 week) for complications. Third postoperative evaluation was done at the end of 8th week for cosmetic outcome assessment. Out of the 100 patients 76 were males and 24 were females (Figure 1).

Gender Distribution

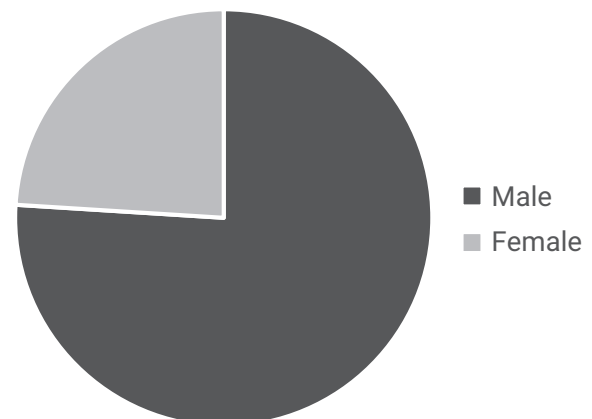


Figure 1: Gender distribution.

Wounds were evaluated for any complications like wound dehiscence, plaque formation and sign of infection. The percentage of each group was calculated. Statistical analysis was performed using chi-square test for parametric variables and the P (probability) and Z values were calculated. No patient in group 1 had immediate postoperative bleeding after suturing while 3 patients in group 2 had immediate postoperative bleeding, which was resolved itself after compression within 2–3 minutes. The incidence of bleeding may be attributed to incomplete haemostasis prior to closure. On the 7th day follow up, one patient in group 2 had wound dehiscence on the forehead region. The wound finally healed uneventfully. Five patients in group 1 and 3 patients in group 2 had the wound infection which were treated by standard protocol

(Figure 2) Statistically, the overall difference between results in both the groups on 7th postoperative day was insignificant (p value > 0.05).

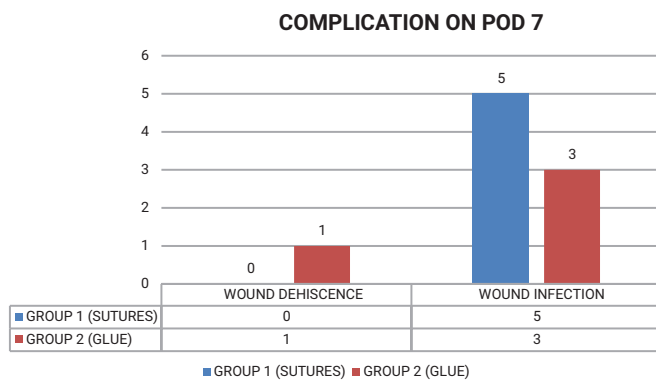


Figure 2: Wound assessment on day 7.

Next postoperative evaluation was done at the 8th week [Figure 3] for cosmesis. Scar was evaluated for patient's and surgeon's satisfaction on a 1–10 point visual analog scale (VAS), where 0 denotes worst possible outcome and 10 is the best possible outcome. The Earlier study by Quinn has demonstrated VAS as a valid scale to measure the cosmetic outcome.

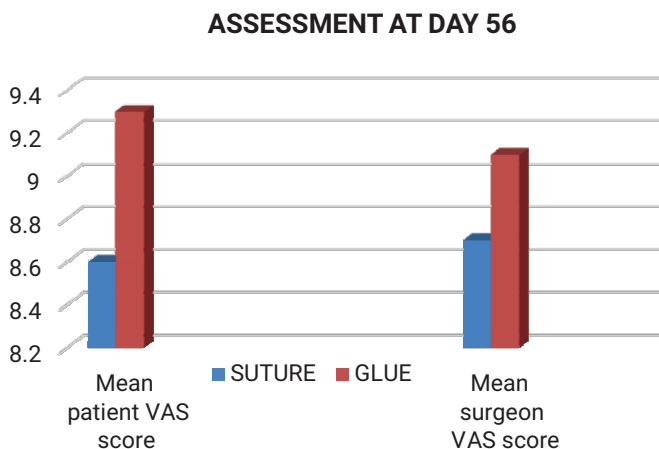


Figure 3: Cosmetic assessment

The mean of the total patient satisfaction score and the surgeon's satisfaction score was calculated with standard deviation. Patient satisfaction score in group 2 (9.3) was higher as compared to group 1 (8.6), but this difference was statistically insignificant ($Z = 1.405$, $P = 0.5$). The surgeon's satisfaction score was also higher in group 2 (9.1) as compared to group 1 (8.7), although this difference was also statistically insignificant ($Z = 1.50$, $P = 0.773$). Overall difference in cosmetic result between both the groups was statistically insignificant.

Discussion

Wound closure biomaterials are divided into three major categories: suture materials, staples and tissue adhesives. Suturing has been the most widely used

method for wound closure because of high reliability of suture materials. However, alternative techniques have long been sought, since suturing technique requires skill and experience, a relatively longer time and the need for its removal. Due to these reasons, surgeons are increasingly using tissue adhesives over sutures for wound closure^[6]. Several studies regarding the use of the tissue adhesives in closure of facial wounds have been conducted to compare their efficacy against the conventional sutures^[7-9]. Historically, the autologous and homologous fibrin tissue adhesives have been extensively used due to their safety and reliability. However, fibrin tissue adhesives carry the risk of viral transmission^[9]. Cyanoacrylate-based adhesive systems are most recent tissue adhesives. The rapid setting time and desirable effect of moisture on polymerization have made them most investigated system. Octyl-2-cyanoacrylate (Dermabond, Ethicon, Inc.) is a recent cyanoacrylate derivative with eight alkyl constituents off the carboxyl group, which slows down the degradation and by-product release into the surrounding tissues. Additionally, plasticizers have been added which make the adhesive bond stronger and more durable but allow flexion of the skin^[10]. Its usage as a skin adhesive was first described by Quinn and Toriumi. Cyanoacrylates have a number of advantages over conventional sutures like their fast and painless application, rapid setting which reduces the total operating time, their antibacterial properties. Cyanoacrylate itself acts as a water proof dressing and helps in reduction in the number of follow-up visits. Also they do not require any needles for application; accidental needle stick injuries are prevented. However, there are certain disadvantages of cyanoacrylates like their less tensile strength and chances of adhesive seepage. Multiple studies have shown equivalence of octyl cyanoacrylate to 5-0 skin sutures in aesthetic facial surgery and repair of traumatic facial wounds.

Discovery of cyanoacrylates by Ardis in 1949^[11] and subsequent use of this material in surgery by Coover et al. in 1959^[12] revolutionized nonconventional suturing technique. cyanoacrylate is an advanced gamma sterilized, nonpigmented, nontoxic, nonallergic, and biostatic tissue adhesive. It helps in rapid wound closure with minimal scarring, and reduces the risk of postsurgical infection and trauma, apart from being simple to use, and showing a demonstrable safety,^[13] thus providing effective wound healing with minimal risk. In our study, a total of seven patients were treated for lacerated wound closure with isoamyl 2cyanoacrylate. Various parameters like swelling, infection, gaping, pain and scar were included to study the outcome. Many papers have shown good

cosmesis and rapid time for a laceration closure using glue^[14,18]. However studies by Jim Quinn et al, Toriumi and Singer et al, have reported results in compliance with the present study in which the overall difference between results in both the groups on 7th postoperative day was statically insignificant. Pain was one of the most serious reasons for anxiety in patients. There was generally no need for local anesthesia injection, which were essential for the traditional wound repair on children. In the study by Matin, the mean time taken for skin closure in adhesive glue group is faster than skin suturing group (150 s vs. 360 s) In the present study, the mean time taken for skin closure via glue was 1.57 ± 0.17 min, which is much faster and time saving. The time required for closure with Dermabond was less than the time required for suture closure. Quinn et al, and Toriumi et al, found similar results in their studies.

There are varying reports regarding the antibacterial properties of cyanoacrylate glue^[19]. The glue has a bacteriostatic effect against Grampositive bacteria while no activity has been reported against gramnegative bacteria^[20]. There have been no reports of any carcinogenic effects.

Overall adhesive glue has more advantage over suture in small clean incised wound specially over face, neck and head and gives better cosmetic outcome with less pain. Healing time may vary person to person depending on their co-morbidities and manner of injury.

Overall difference in cosmetic result between both the groups was statistically insignificant. Similar result was found in several other prior studies by Quinn, Toriumi, and Singer et al. However, a study by Bernard Laurie et al, showed a statistically significant difference on VAS scale in favour of sutures. The cost effectiveness in both the groups were also measured and it was found that cost of the material in the case of group 2 was higher, than the group 1. Martin et al, did an economic comparison between adhesives and sutures and found tissue adhesives to be more efficient economically.

Conclusion

The cyanoacrylate tissue adhesive cyanoacrylate are excellent "no needle" alternative for closure of selected lacerations, those that are short, clean and under low tension. Cyanoacrylates glue is having fast and painless application, rapid setting with antibacterial properties. Cyanoacrylate itself acts as a water proof dressing and helps in reduction in the number of followup visits. As they do not require any needles, accidental needle stick injuries are prevented. Disadvantages of cyanoacrylates like their less tensile

strength and chances of the adhesive seepage are also there. In our study, it has been observed that the efficacy of cyanoacrylate in the closure of surgical wounds is comparable to the suture in some conditions. Despite the few advantages of the tissue adhesives, it is important to remember that wound closure is just one part of the wound management. Many wounds require irrigation, debridement, and deep sutures, which may require time, multiple dressing and anaesthesia. In summary, cyanoacrylate is easy, and safe, with no complications, and results in even better cosmesis. It is a viable alternative in areas such as the head, neck and face where a dressing is unsightly or difficult to apply.

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