Section: Dentistry

Original Research Article

A COMPARISON OF TISSUE ADHESIVE GLUE AND CONVENTIONAL SUTURE IN FACIAL WOUND CLOSURE

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ABSTRACT

Background: Facial wound closure plays a critical role in surgical outcomes, particularly regarding healing, infection control, patient comfort, and cosmetic appearance. Traditional sutures, while effective, are associated with prolonged operative time and increased postoperative care. Tissue adhesives, particularly cyanoacrylate-based formulations, have emerged as alternatives offering quicker application and reduced tissue trauma. This study compares the effectiveness of cyanoacrylate tissue adhesive with conventional polypropylene sutures in facial laceration management.

Materials and Methods: A prospective clinical study was conducted on 30 patients aged 15–40 years with facial lacerations, randomly assigned to two groups (n=15 each). Group S received wound closure using polypropylene sutures, while Group T was treated with isoamyl-2-cyanoacrylate adhesive. Parameters assessed included pain (Visual Analog Scale) on postoperative days 3 and 7, time required for closure, wound infection and inflammation on days 7 and 14, dehiscence, and aesthetic outcome (evaluated on days 1, 7, and 24 using a 6-point cosmetic score).

Results: Group T (glue) showed significantly lower mean pain scores on day 3 (1.4 ± 0.63) and day 7 (0.33 ± 0.61) compared to Group S (suture) with scores of 3.86 ± 0.91 and 1.80 ± 0.67 respectively ($p < 0.001$). The average time for closure was shorter in Group T (1.06 ± 0.45 mins) versus Group S (5.86 ± 1.32 mins). Infection rates on day 14 were 20% in Group T and 46.7% in Group S. Inflammation was milder and resolved earlier in Group T. Wound dehiscence on day 14 occurred in 13.3% of Group T and 60% of Group S. Cosmetic scores were more favorable in Group T on day 24 (mean 0.80) compared to Group S (mean 2.46).

Conclusion: Cyanoacrylate tissue adhesive demonstrated superior performance over polypropylene sutures in terms of reduced pain, quicker closure, lower infection and dehiscence rates, and better esthetic results. It offers a reliable, patient-friendly alternative for facial wound closure.

Keywords: Cyanoacrylate, Facial laceration, Wound closure, Tissue adhesive, Polypropylene sutures, Esthetic outcome, Postoperative infection, Wound healing.

INTRODUCTION

Facial wound closure is a fundamental aspect of maxillofacial surgical care, where both functional recovery and esthetic outcomes are of high importance. Traditionally, sutures have been the mainstay of wound closure, offering tensile strength and tissue approximation. However, they are associated with certain disadvantages, including increased operative time, discomfort, and potential for infection due to multiple skin punctures.[1]

Advancements in wound management have introduced alternatives like tissue adhesives, which provide a rapid, non-invasive means to approximate skin edges. Among these, cyanoacrylate-based adhesives have gained prominence due to their

hemostatic, bacteriostatic, and waterproof properties.[2] These adhesives polymerize upon contact with moisture, creating a strong bond that seals the wound externally without penetrating the tissue.[3] Their rapid application and reduced need for postoperative care make them advantageous, especially in pediatric and emergency care settings.[4] Historically, the evolution of suture materials—from natural fibers like silk and catgut to modern synthetic polymers—has improved healing outcomes, yet they continue to pose risks such as tissue trauma and foreign body reactions.[5] On the other hand, tissue adhesives like n-butyl and isoamyl cyanoacrylate have shown promising clinical results, including reduced inflammation, faster healing, and better patient satisfaction.[6,7]

Studies comparing sutures with cyanoacrylate adhesives suggest that the latter can significantly reduce closure time and postoperative pain while achieving comparable, if not superior, esthetic results.[8] Furthermore, tissue adhesives reduce the risk of needlestick injuries and eliminate the requirement for suture removal, enhancing both patient safety and clinical efficiency.[9]

Given these potential advantages, this study was designed to compare the clinical efficacy of cyanoacrylate tissue adhesive and conventional polypropylene sutures in the closure of facial lacerations. Parameters such as pain, infection rate, inflammation, wound dehiscence, and cosmetic outcomes were evaluated to determine the superiority of one technique over the other.

MATERIALS AND METHODS

Study Design and Setting: This prospective clinical study was conducted in the Department of Oral and Maxillofacial Surgery at Chandra Dental College and Hospital, Safedabad, Barabanki (U.P.), from 2021 to 2024. The aim was to compare the effectiveness of cyanoacrylate tissue adhesive and conventional polypropylene sutures in closing facial lacerations.

Sample Size and Group Allocation: A total of 30 patients aged between 15 to 40 years presenting with clean, linear facial lacerations less than 6 hours old were enrolled after obtaining written informed consent. Patients were randomly assigned into two equal groups:

- Group S (n = 15): Wounds closed using 4-0 polypropylene sutures.
- Group T (n = 15): Wounds closed using isoamyl-2-cyanoacrylate tissue adhesive.

Inclusion Criteria

- Patients aged 15–40 years.
- Clean, non-gaping facial wounds less than 6 hours old.
- American Society of Anesthesiologists (ASA) physical status I or II.
- Patients willing to participate and provide informed consent.

Exclusion Criteria

- ASA grade III or higher.
- History of keloid or hypertrophic scar formation.
- Known allergy to cyanoacrylate compounds.
- Presence of diabetes, immunosuppressive disorders, or other systemic conditions that impair wound healing.
- Contaminated or complex lacerations.

Preoperative Evaluation: All patients underwent a thorough medical history review and clinical examination. An intradermal patch test was performed in Group T to rule out hypersensitivity to cyanoacrylate.

Procedure Protocol: In both groups, local anesthesia was administered prior to wound management. Standard aseptic techniques were followed.

- Group S: Wound edges were approximated and closed using simple interrupted polypropylene sutures. Sutures were removed on postoperative day 7.
- Group T: After ensuring the patient had no allergic reaction, wound edges were aligned manually or with Adson forceps. Three successive layers of cyanoacrylate were applied at 15-second intervals. No dressing was applied postoperatively, as the glue formed a self-sealing protective layer.

Postoperative Evaluation Parameters: Patients were assessed on postoperative days 1, 3, 7, and 24 for the following:

- **Pain:** Measured using a 9-point Visual Analog Scale (VAS), where 0 represented no pain and 8 indicated severe pain.
- **Time of Closure:** Recorded in minutes from the start to the completion of the closure procedure.
- **Infection:** Clinically assessed on days 7 and 14 based on redness, swelling, pus discharge, and local tenderness.
- **Inflammation:** Evaluated on days 3 and 7 using clinical markers (rubor, calor, tumor, dolor, and functio laesa).
- **Wound Dehiscence:** Documented on days 7 and 14.
- **Aesthetic Outcome:** Assessed using a 6-point validated scale, scoring presence or absence of step-off borders, margin separation, wound edge inversion, excessive distortion, contour irregularities, and overall appearance. A score of 6 was considered ideal.

Data Analysis: All collected data were entered in Microsoft Excel and analyzed using SPSS version 24. Continuous variables were expressed as mean ± standard deviation (SD), while categorical data were presented as frequencies and percentages. The Student's unpaired t-test and Chi-square test were used where appropriate. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 30 patients participated in the study, with 15 individuals in each group. Group T received tissue adhesive glue, while Group S underwent conventional suture closure. All subjects were evaluated for pain, time required for wound closure, incidence of infection, inflammation, wound dehiscence, and esthetic outcomes over a 24-day period.

Demographics and Pain Scores: The mean age was comparable between Group T (30.0 ± 5.9 years) and Group S (31.7 ± 6.6 years), with equal gender distribution in both groups (10 males and 5 females). On postoperative day 3, Group T reported significantly lower pain scores (1.40 ± 0.63) compared to Group S (3.86 ± 0.91). This trend continued on day 7, with scores of 0.33 ± 0.61 in Group T and 1.80 ± 0.67 in Group S [Table 1].

Table 1: Patient Demographics and Pain Assessment

Parameter	Group T (n = 15)	Group S (n = 15)	p-value
Mean Age (years)	30.0 ± 5.9	31.7 ± 6.6	0.459
Gender (M:F)	10:5	10:5	1.000
VAS Score – Day 3	1.40 ± 0.63	3.86 ± 0.91	<0.001
VAS Score – Day 7	0.33 ± 0.61	1.80 ± 0.67	<0.001

Closure Time and Postoperative Infections: Group T exhibited a shorter mean closure time (1.06 ± 0.45 minutes) compared to Group S (5.86 ± 1.32 minutes). On day 7, infection was noted in 13.3% of Group T and 26.7% of Group S. By day 14, infection rates increased to 20% in Group T and 46.7% in Group S [Table 2].

Table 2: Closure Time and Postoperative Infection

Parameter	Group T	Group S	p-value
Time for Closure (minutes)	1.06 ± 0.45	5.86 ± 1.32	<0.001
Infection – Day 7 (%)	2/15 (13.3%)	4/15 (26.7%)	0.380
Infection – Day 14 (%)	3/15 (20.0%)	7/15 (46.7%)	0.141

Inflammation and Wound Dehiscence: On day 3, most patients in Group T had mild inflammation (80%) compared to 66.7% in Group S. By day 7, 53.3% of Group T showed no inflammation, whereas all patients in Group S showed at least mild signs. Wound dehiscence was observed in 20% of Group T and 26.7% of Group S on day 7. However, on day 14, dehiscence was higher in Group S (60%) compared to Group T (13.3%) [Table 3].

Table 3: Inflammation and Wound Dehiscence

Parameter	Group T	Group S
Inflammation – Day 3 (%)	None: 6.7%	None: 0%
	Mild: 80%, Mod: 13.3%	Mild: 66.7%, Mod: 13.3%
Inflammation – Day 7 (%)	None: 53.3%	None: 0%
	Mild: 40%, Mod: 6.7%	Mild: 13.3%, Mod: 86.7%
Dehiscence – Day 7 (%)	3/15 (20.0%)	4/15 (26.7%)
Dehiscence – Day 14 (%)	2/15 (13.3%)	9/15 (60.0%)

Aesthetic Evaluation: On day 1, both groups showed minimal esthetic differences. However, by day 7, Group T had significantly better scores (mean: 1.73 ± 0.59) than Group S (2.86 ± 0.77). On day 24, final evaluation again favored Group T with a mean score of 0.80 ± 0.56 compared to 2.46 ± 0.74 in Group S [Table 4].

Table 4: Esthetic Outcome (6-Point Scar Assessment)

Postoperative Day	Group T (Mean ± SD)	Group S (Mean ± SD)	p-value
Day 1	0.60 ± 0.51	0.93 ± 0.26	0.065
Day 7	1.73 ± 0.59	2.86 ± 0.77	<0.001
Day 24	0.80 ± 0.56	2.46 ± 0.74	<0.001

DISCUSSION

The findings of this study highlight the clinical advantages of using cyanoacrylate tissue adhesive over conventional suturing techniques in facial wound closure. The adhesive demonstrated reduced operative time, better pain control, lower incidence of infection, and superior esthetic outcomes, supporting its efficacy in head and neck wound management.

The significantly lower pain scores in the adhesive group on postoperative days 3 and 7 align with previous studies reporting reduced nociceptive response due to the non-invasive nature of tissue adhesives.[1,2] Unlike sutures, which require needle penetration and multiple skin punctures, cyanoacrylates seal the epidermis without disturbing deeper tissues, contributing to improved patient comfort.[3]

Time efficiency was another notable advantage. The mean closure time in the adhesive group was significantly shorter, corroborating earlier research where cyanoacrylate application reduced operating time by more than 50% compared to suturing.[4,5] This can be especially beneficial in emergency settings or pediatric care, where procedural speed and patient cooperation are critical.[6]

Postoperative infection rates were also lower in the adhesive group. The inherent bacteriostatic properties of cyanoacrylate, combined with the absence of puncture sites, likely contributed to this outcome.[7] Sutures, by contrast, act as a foreign body and create multiple channels for microbial entry, increasing the risk of local infection.[8,9] These findings are consistent with studies that have observed decreased bacterial colonization and wound-related complications when tissue adhesives were employed.[10]

Inflammatory signs were also less pronounced in the adhesive group. This is likely due to reduced tissue trauma and minimal foreign material left in the wound environment. Similar trends have been observed in prior histological studies comparing inflammatory markers between suture and adhesive closure methods.[11,12] The faster resolution of inflammation may also explain the improved healing and reduced scar tissue formation observed in the adhesive group.

Wound dehiscence was notably less frequent with cyanoacrylate, especially by day 14. Although sutures generally offer strong tensile strength, poor wound edge approximation or premature suture loosening can increase the risk of dehiscence. The strong surface bonding provided by cyanoacrylate, which forms a waterproof seal, might offer a more stable closure in low-tension areas of the face.[13]

Cosmetic outcomes were better in the adhesive group across all postoperative evaluations. This agrees with several randomized trials reporting superior or comparable scar appearance using adhesives, particularly when evaluated after several weeks or months.[14] The absence of suture marks, precise wound edge alignment, and reduced inflammation are likely contributors to enhanced cosmetic healing.[15]

However, it is important to acknowledge the limitations of tissue adhesives, including their unsuitability for high-tension wounds, allergies to acrylates in rare cases, and a slightly higher initial material cost. Yet, the long-term economic benefit, through reduced follow-up visits and minimal need for dressing changes, often offsets this cost.

CONCLUSION

In conclusion, this study supports the use of cyanoacrylate adhesives as a safe and effective alternative to sutures in appropriate facial wounds. Their benefits in terms of operative efficiency, patient comfort, and cosmetic results make them a valuable addition to clinical wound management protocols.

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