



A COMPARATIVE STUDY OF CYANOACRYLATE GLUE WITH SUTURE FOR WOUND CLOSURE.

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ABSTRACT

Background: A basic need for skin closure is tissue approximation. A good tissue reunion and cosmetically acceptable scar is an ideal surgeon's practice. Wound closure techniques have evolved from early developments in suturing material to advanced resources that include skin staplers, skin glue and adhesive tapes. Based on efficacy of advanced suturing techniques patient may be benefited with better cosmesis, lesser postoperative pain and less wound infection, lesser hospital stay. Hence it is wise to study and compare adhesive glue with suture material for the better outcome. **Materials And Methods:** The present study is a prospective comparative study which consisted of a total of 60 patients. All the patients were from the Department of General Surgery in Maharajah institute of medical sciences, Vizianagaram, Andhra Pradesh, from OCTOBER 2022 to OCTOBER 2023. We shall take a detailed history and thorough examination of the patient and wound performed. Routine blood tests like complete hemogram, BT, CT, HIV, HBsAg, blood sugars, blood urea, serum creatinine, and other relevant investigations were sent for people selected for elective suturing or gluing, including all the recruited 60 patients of traumatic wounds. This is an open label prospective study so depending on patient preference, the patients were counselled and then set and subjected to wound closure either with a non-absorbable suture using prolene or nylon or n-butyl-2- cyanoacrylate. After the procedures, the patients were divided into groups of 30 each and named Group A (patients who received n-butyl-2- cyanoacrylate) and Group B (patients who received non-absorbable sutures). **Results:** The present study included different parameters in the process of wound healing like age, gender, time taken to heal, and other demographic variables, this article mainly conferred on cosmetic outlook after closure, pain and cost-effectiveness. The current study assessed cosmetic outcomes using the Hollander wound evaluation scale and pain using Visual Analogue scale. In the present study subjects of Majority belong to 1-10 years age group. Mean age was 14 years \pm 11.4 SD. Male study subjects constitute 70% and females constitute 30%. Majority of study subjects were males. Among study subjects who received tissue glue for skin closure in wound had 80% optimal and 20% sub-optimal cosmetic outlook. Among study subjects who received tissue glue for skin closure, 63% had no pain after the procedure, 30% complained mild pain, 3% moderate and other 3% severe pain, whereas only 17% had no pain, 33% had mild, 20% had moderate and 30% had severe pain among who received suture material. Comfortability, less chance of Infections, no need for dressing, absence of suture removal and lesser visits made the patients more satisfied with glue application than the suturing. Though the adhesives cost more than the suturing, people are willing to opt gluing procedure as the difference is meagre and affordable. **Conclusion:** The study supports the usage of glue in place of sutures for its efficacious cosmetic outlook of skin closure, reduced post-operative pain and cost-effectiveness. Also, the study considers and encourages the technical advancements in wound healing techniques to better the lives of people and strongly recommends the shift from conventional suturing to adhesives.

KEYWORDS :

INTRODUCTION

A basic need for skin closure is tissue approximation. A good tissue reunion and cosmetically acceptable scar is an ideal surgeon's practice. Wound closure techniques have evolved from early developments in suturing material to advanced resources that include skin staplers, skin glue and adhesive tapes. Based on efficacy of advanced suturing techniques patient may be benefited with better cosmesis, lesser postoperative pain and less wound infection, lesser hospital stay. Hence it is wise to study and compare adhesive glue with suture material for the better outcome[1].

The most used technique after suturing is adhesives. Sutures provide a source of infection through the suture canal, peri suture cuff of the dead epidermis, dermis, and fat and the foreign body inflammatory response.

Cyanoacrylate is the first adhesive used for skin closure, which polymerizes in contact with human tissues. Polymerization is an exothermic chemical reaction that generates heat. Cyanoacrylates initially gained fame in 1958 as a super strong, fast-drying glue[2].

Several other compounds from the family of cyanoacrylate

have developed, such as methyl cyanoacrylate, ethyl cyanoacrylate, isobutyl cyanoacrylate and butyl cyanoacrylate[3].

When a surgeon sutures a clean incision, healing takes place with minimal loss of tissue with minimal scarring. In contrast, the usage of tissue glue showed better results than suture material[4]. The first glue developed-methyl cyanoacrylate failed to qualify as a tissue adhesive as it showed potential tissue toxicity and inflammation due to its short molecular chain. Depending on the grade of this reaction, the glue may cause pain when applied to the skin[5].

Tissue adhesive has been used as a safe alternative to sutures, particularly in children, as it does not require local anaesthesia and suturing, and children are comfortable with this method.

This study infers the benefits of tissue adhesives over suturing in terms of cosmetic outlook, cost effectiveness and less postoperative pain.

Aims And Objectives

To compare tissue glue with suture for skin closure in wounds

for following characters in the patients attending outpatient department and casualty at NRI institute of Medical sciences, Visakhapatnam.

- 1) Cosmetic outlook after closure.
- 2) Pain
- 3) Cost-effectiveness

Methodology

The present study is a prospective comparative study which consisted of a total of 60 patients. We had a total of 87 patients for whom we have done suturing and glue procedures ,but only 60 patients have given consent to be included in the study. Hence we have taken 60 patients into our study by using convenient sampling. All the patients were from the Department of General Surgery in Maharajah institute of medical sciences, Vizianagaram, Andhra Pradesh, from OCTOBER 2022 to OCTOBER 2023. Institutional Ethical Committee approved the study.

Inclusion Criteria

- Patients presenting to the Dept of General Surgery in the OPD and casualties with traumatic wounds in age groups 1-50
- Traumatic superficial clean wounds

Exclusion Criteria

- Traumatic wounds that need to be closed under tension
- Contaminated traumatic injuries
- Known personal or family history of keloid formation or scar hypertrophy
- A known allergy to tissue glue.
- Patients who have not given consent to be included in the study.

Data Collection:

We shall take a detailed history and thorough examination of the patient and wound performed. Routine blood tests like complete hemogram, BT, CT, HIV, HBsAg, blood sugars, blood urea, serum creatinine, and other relevant investigations

were sent for people selected for elective suturing or gluing, including all the recruited 60 patients of traumatic wounds. This is an open label prospective study so depending on patient preference, the patients were counselled and then set and subjected to wound closure either with a non-absorbable suture using prolene or nylon or n-butyl-2- cyanoacrylate. After the procedures, the patients were divided into groups of 30 each and named Group A (patients who received n-butyl-2-cyanoacrylate) and Group B (patients who received non-absorbable sutures).

GLUE GROUP (A): Initially the wound will be completely washed, hemostasis secured and dried. The adhesive shall be applied in a single layer while keeping two ends of the incised wound stretched using forceps. After applying glue and closing the wound, the approximate time to hold the wound is 1 min for an accurate approximation of the wound till a strong bond form.

Following the procedure, the patients were kept under observation for 30minutes to one hour and discharged with some oral antibiotic protocol for five days. The amount of pain after the procedure a patient feels ranges from none to extreme amount of pain, which was analysed by the Visual Analogue Scale (VAS). From the patient's perspective, this spectrum is categorized into none, mild, moderate, and severe.



Fig 6.visual Analogue Scale

SUTURE GROUP (B): Initially the wound will be completely washed with 5% betadine and normal saline.. Under local anaesthesia with 2% lignocaine skin approximated with 4-0 prolene or 3-0 nylon with simple interrupted sutures and a betadine ointment dressing applied. Following the procedure, the patients were kept under observation for 30 min to one hour and discharged with some oral antibiotic protocol for five days. Patients were advised to come after seven to 10 days for suture removal, depending on the site of suturing.

We shall assess the post operative pain and cost-effectiveness following the procedures. When calculated the expenditure for the procedures including administration and follow up ,the expenditure for glue was Rs 700 INR and for suture was Rs 1000 INR. At the first instance glue was felt expensive during administration compared to suture but expenditure for suture outweighed the expenditure for glue due to dressing and suture removal charges for sutured patients during follow up visits.

We shall check the wound healing of the patients during their visits to the hospital at certain intervals of 1week ,15 days up to 3 months, depending upon their improvement. We will assess the cosmetic appearance of the wound 3 months after closure. An independent examiner will evaluate the cosmetic appearance using a Hollander wound evaluation scale. The wound will be assigned by 0 or 1 each for the presence or absence of the following:

- Step off borders
 - Contour irregularity – puckering
 - Scar width: greater than 2 mm
 - Edge inversion or sinking or curling
 - Inflammation: redness and discharge
 - Overall cosmesis
- Total score is the addition of all the scores; *WES scale: used for evaluation of the wound. In each of the six variables, the score of 0 is given for yes and 1 for no.

Table 2: Hollander Wound Evaluation Scale

Wound with a score of 6 will be considered optimal cosmetic appearance, and a score of <5 is considered a suboptimal appearance.

Statistical analysis:

I have used student 't' test for statistical analysis by using SPSS software.

OBSERVATIONS AND RESULTS

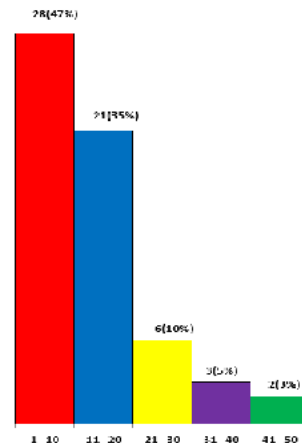


Figure 1: Distribution of study subjects based on Age (n=60)

Study subjects of 1-10 years age group constitute 47%, 11-20 years constitute 35%, 21-30 years constitute 10%, 31-40 years constitute 5% and 41-50 years constitute the other 3%. The majority belong to 1-10 years age group. Mean age was 13.85 years ± 11 SD.

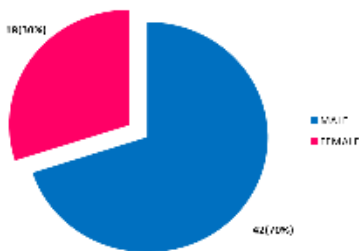


Figure 2: Distribution of study subjects based on Gender (n=60)

Male study subjects constitute 70% and females constitute 30%. Majority of study subjects were males.

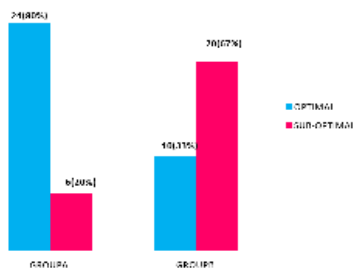


Figure 3: Distribution of study subjects based on Cosmetic outlook in Glue (Group A) and Sutured (Group B) groups

Among study subjects who received tissue glue for skin closure in wound had 80% optimal and 20% sub-optimal cosmetic outlook. Among study subjects who received suturing material for skin closure in wound had 33% optimal and 67% sub-optimal cosmetic outlook. Independent t-test on both the groups suggested that study subjects who received tissue glue for skin closure in wound had better cosmetic outlook which is statistically significant ($p < 0.05$).

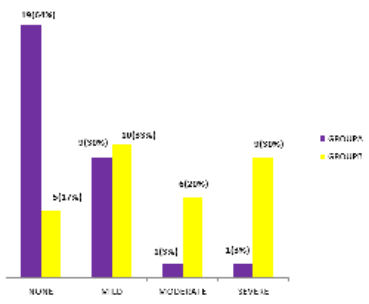


Figure 4: Distribution of study subjects based on Pain in Glue (Group A) and Sutured (Group B) groups (n=60)

Among study subjects who received tissue glue for skin closure, 64% had no pain during the procedure, 30% complained mild pain, 3% moderate and other 3% severe pain, whereas only 17% had no pain, 20% had moderate and 30% had severe pain among who received suturing material. (P value < 0.05).

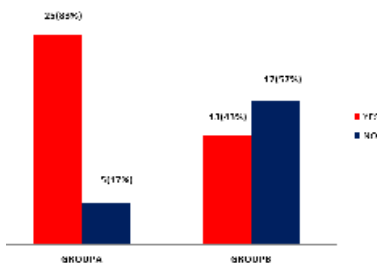


Figure 5: Distribution of study subjects based on Cost

effectiveness in Glue (Group A) and Sutured (Group B) groups (n=60)

Among study subjects who received tissue glue for skin closure cost-effectiveness is seen among 83% of the study subjects whereas it is only 43% among those who received suturing material. (P value 0.05).

Table 3: Distribution of study subjects based on Age group (n=60)

AGE GROUP	GROUP A (n)	GROUP B(n)	Total
1-10 years	17	11	28
11-20 years	13	8	21
21-30 years	0	6	6
31-40 years	0	3	3
41-50 years	0	2	2
Total	30	30	60
Mean ± SD	8.9 ± 6.7 SD	18.7 ± 12.3 SD	13.85 ± 11

Table 4: Distribution of study subjects based on Gender (n=60)

GENDER	GROUP A (n)	GROUP B(n)	Total
MALE	20	22	42
FEMALE	10	8	18
Total	30	30	60

Table 5: Distribution of study subjects based on Pain Scale (n=60)

PAIN SCALE	GROUP A (n)	GROUP B(n)
NONE	19	5
MILD	9	10
MODERATE	1	6
SEVERE	1	9
Total	30	30

Table 6: Distribution of study subjects based on Cost Effectiveness (n=60)

COST EFFECTIVENESS	GROUP A (n)	GROUP B(n)
YES	25	13
NO	5	17
Total	30	30

Table 7: Distribution of study subjects based on Wound Closure (n=60)

WOUND CLOSURE	GROUP A (n)	GROUP B(n)
OPTIMAL	24	10
SUB-OPTIMAL	6	20
Total	30	30

DISCUSSION

Wound closure techniques are essential for quick recovery and good cosmetic outcomes. All these techniques mainly target approximating the wound edges without disturbing the natural healing process. Suturing is a routine and gold standard technique for wound closure due to its cost-effectiveness and availability. But with the advancement of technology, both surgeons and patients are opting for faster, more comfortable, and cosmetically better technique. Though the suturing technique is known to retain maximum tensile strength, it is associated with postoperative pain, regular visits to patients for dressing, and suture removal, which costs the patient and causes anxiety or discomfort.

Suturing is also more susceptible to microbial invasion, leading to surgical site infection. These flaws of suturing, done the research for better material for the wound closure technique, led to the discovery of skin adhesive glue cyanoacrylate.

Though the present study included different parameters in the process of wound healing like age, gender, time taken to heal, and other demographic variables, this article mainly conferred on cosmetic outlook after closure, pain and cost-

effectiveness. The current study assessed cosmetic outcomes using the Hollander wound evaluation scale and pain using Visual Analogue scale.

In the present study subjects of 1-10 years age group constitute 47%, 11-20 years constitute 35%, 21-30 years constitute 10%, 31-40 years constitute 5% and 41-50 years constitute other 3.3%. Majority belong to 1-10 years age group. Mean age was 14 years \pm 11.4 SD. Male study subjects constitute 70% and females constitute 30%. Majority of study subjects were males. Among study subjects who received tissue glue for skin closure in wound had 80% optimal and 20% sub-optimal cosmetic outlook.

Among study subjects who received tissue glue for skin closure, 63% had no pain after the procedure, 30% complained mild pain, 3% moderate and other 3% severe pain, whereas only 17% had no pain, 33% had mild, 20% had moderate and 30% had severe pain among who received suture material.

Among study subjects who received tissue glue for skin closure cost-effectiveness is seen among 83% of the study subjects whereas it is only 43% among those who received suture material.

Majority of study subjects are of age group 1 – 10 years in both Groups A and Groups B. In Group A there were no study subjects above the age 21 years. In Group B majority are below the age of 30 years. Male Study subjects are major in both Group A whereas female subjects are major in Group B. Female are less as compared to male in group A. In Group A most of the patients have no pain followed by mild pain. In Group B most of them have moderate and severe pain. There is significant association at P value <0.05 . Cost Effectiveness is observed in Group A whereas there is no much cost effectiveness in group B. There is significant association at P value <0.05 . Optimal wound closure is seen in Group A Patients and in Group B the wound closure is suboptimal.

Among study subjects who received suture material for skin closure in wound had 33% optimal and 67% sub-optimal cosmetic outlook. Independent t-test on both the groups suggested that study subjects who received tissue glue for skin closure in wound had better cosmetic outlook which is statistically significant ($p < 0.05$). Similar to the present study, Keng et al., in a randomized series of 43 patients groin incision operations, found that the glued wounds had consistent better cosmetic results (mean score of 4.71 at four weeks) compared to superficial interrupted suture wounds (mean score 4.00 at four weeks) with a P < 0.05 [28].

After the procedure, the patient was observed for up to an hour. Visual Analog Scale (VAS) was used to assess postoperative pain, which the patients themselves filled up. Among study subjects who received tissue glue for skin closure, 63% had no pain after the procedure, 30% complained mild pain, 3% moderate and other 3% severe pain, whereas only 17% had no pain, 33% had mild, 20% had moderate and 30% had severe pain after the procedure among who received suture material. Unlike this study, other studies by Zempsky et al., and Arunachalam et al., have compared the postoperative pain using a visual analogue scale and showed less postoperative pain following adhesive glue closures but had failed statistical significance[34][35].

Comfortability, less chance of Infections, no need for dressing, absence of suture removal and lesser visits made the patients more satisfied with glue application than the suturing. Though the adhesives cost more than the suturing, people are willing to opt gluing procedure as the difference is meagre and affordable. Supporting our study, Christopher Jones S et al. conducted a study on the economic outcome. They found that

overall, it was significantly more economical to use skin adhesive (20.3 Euros) than sutures (29.3 Euros) ($p < 0.001$)[33].

CONCLUSION

The study supports the usage of glue in place of sutures for its efficacious cosmetic outlook of skin closure, reduced post-operative pain and cost-effectiveness. Also, the study considers and encourages the technical advancements in wound healing techniques to better the lives of people and strongly recommends the shift from conventional suturing to adhesives.

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