

## Comparative Study of Tissue Glue vs Traditional Suturing in Skin Approximation in Surgical Wound Closure: A Randomised Control Trial

Adhiyaman Manimaran<sup>1</sup>, Narenkumar A<sup>2</sup>, Swathi Vellaichamy<sup>3</sup>, Gokul D Yatheendranathan<sup>4</sup>

<sup>1</sup>Senior Resident, Department of General Surgery, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth (Deemed to be University), Ammapettai, Chengalpet District, Tamil Nadu, 603108

<sup>2</sup>Associate Professor, Department of General Surgery, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth (Deemed to be University), Ammapettai, Chengalpet District, Tamil Nadu, 603108

<sup>3</sup>Senior Resident, Department of General Surgery, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth (Deemed to be University), Ammapettai, Chengalpet District, Tamil Nadu, 603108

<sup>4</sup>Associate Professor, Department of General Surgery, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth (Deemed to be University), Ammapettai, Chengalpet District, Tamil Nadu, 603108

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Corresponding author: Dr. Gokul D Yatheendranathan

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### Abstract:

**Introduction:** Tissue approximation is one of the fundamental requirements for skin closure. An ideal surgeon's practise would result in a satisfactory tissue reunion and a scar that is cosmetically acceptable. If advanced suturing techniques are effective, the patient might experience less anxiety, better cosmesis, less postoperative pain, fewer wound infections, and shorter stays in the hospital as a result of these benefits.

**Objective:** To compare between tissue glue and traditional suturing and its adequacy in skin approximation, and to evaluate the pain score of the patient between the two techniques.

**Method:** Randomized controlled trial was conducted among fifty Patients who came to ER, OPD as well as IP of General Surgery Shri Sathya Sai Medical College and Research Institute, a Tertiary Care Hospital, Ammapettai, Chengalpet District, South India. This was done to study the efficacy, patient satisfaction levels, cosmetic outcome and cost effectiveness between skin adhesive and suture material in skin approximation during surgical wound closure.

**Results and Discussion:** The mean of the study group and control group was found to be 44.09±6.3 and 45.63±8.4 years respectively. Most of the patients were males. Postoperative pain score is better in Tissue glue group compared to traditional suturing group. Association is statistically significant (P<0.05). Duration of procedure is less in Tissue glue group compared to Traditional suturing group. Wound infection is more in traditional suturing compared to Tissue glue. Association is statistically significant (P<0.05).

**Conclusion:** Our study proved that tissue glue is better than traditional suturing. The two groups are comparable with respect to age, sex, mean haemoglobin and diabetes status. Mean duration of procedure is less in tissue glue group. Postoperative pain score and wound infection is better in tissue glue group.

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### Introduction

Achieving proper tissue alignment stands as a fundamental necessity in the process of closing the skin. An optimal approach by a skilled surgeon should yield a satisfactory reconnection of tissues, leading to a scar that is aesthetically pleasing. Modern advancements such as skin staplers, adhesive skin glue, and adhesive tapes have taken the place of earlier innovations in suture materials,

marking the progression of wound closure methods.[1]

When contemporary suturing techniques prove effective, patients can experience several advantages, including diminished stress, enhanced cosmetic results, reduced post-surgical discomfort, fewer instances of infection, and shorter hospital stays.[2] This has spurred our aim to investigate

and compare the efficacy of adhesive glue versus suture materials in generating superior outcomes for patients.[3,4] Our objective is to assess the techniques of skin approximation—namely, adhesive glue and traditional suturing—by evaluating their capacity to predict heightened levels of patient contentment, improved cosmetic appearance, and decreased pain levels.[5,6]

The aim of the study is to observe the efficacy, patient satisfaction levels, cosmetic outcome and cost effectiveness between skin adhesive and suture material in skin approximation during surgical wound closure and to compare between tissue glue and traditional suturing and its adequacy in skin approximation

### Methodology

**Study Design:** Randomized controlled trial.

**Study Area:** Shri Sathya Sai Medical College and Research Institute, a Tertiary Care Hospital, Ammapettai, Chengalpeta District, South India.

**Study Population:** Patient coming to ER, OPD as well as IP of General Surgery in SSSMCRI

**Sample Size:** Sample size calculation was based on the previous study<sup>3</sup>, wherein the mean and standard deviation of the tissue glue group is  $5.74 \pm 0.69$  and the traditional suturing group is  $3.1 \pm 0.93$ , with 5% level of significance and 50% power, the total sample size is 25 in each group including 10% non response error.

### Study Duration:

18 months

### Interventions/Drugs Used:

Tissue glue & Suture material: Polyamide 2-0

### Materials and Method:

Skin approximation was performed by using 2-0 Polyamide in 50% patients and tissue adhesive in

remaining 50% of the patients. All the patients who had a clean wound - skin laceration underwent this study. All suturing and glue application were performed by the same single surgeon only. Post procedure review was done for the subjects in both the groups after two weeks.

**Method of Sampling:** Universal sampling

### Inclusion Criteria:

- Patients of age 18-70 years, who require skin approximation after surgical procedures or suturing as treatment.
- Patients presenting with clean wounds.
- Non diabetics

### Exclusion Criteria:

- Patients who had type 1 or type 2 diabetes
- Patients with contaminated or dirty wounds.
- Wounds undergoing secondary suturing.

**Ethical Considerations:** Full consent was obtained from the participants prior to the study in a language convenient to the patient and the investigators. The consent form was approved by the investigators and ethical committee. The expenses of the patient who comes under the tissue glue treatment were bare by the primary investigator

**Data Collection:** Patient history were taken according to a standard questionnaire and subjected to clinical examination after getting written informed consent.

**Statistical Methods:** The present study is a randomised controlled trial containing 25 participants in each group. Data was entered in Microsoft excel and analysed using SPSS version 24.0.

### Results

A total of 50 patients were included in the study.

**Table 1: Age Distribution of Study Groups**

Group	Number	Mean of Age	S.D.	t	P value
Tissue glue	25	44.09	6.3	0.08	0.93
Traditional suturing	25	45.63	8.4		

The two groups are comparable with respect to age

Table 1 examines the age of participants in both groups and assesses whether there are significant differences in age between the two methods of wound closure. The study involves two groups: tissue glue and traditional suturing, which represents different techniques for wound closure. Each group consists of 25 participants, making the sample size equal in both groups. The "Mean of Age" column displays the average age of participants in each group. The average age of participants in the "Tissue glue" group is 44.09

years, while in the "Traditional suturing" group, it's 45.63 years. In the "Tissue glue" group, the standard deviation is 6.3 years, and in the "Traditional suturing" group, it's 8.4 years. This indicates that the ages of participants in the "Tissue glue" group are less spread out compared to those in the "Traditional suturing" group. The p-value, for the "Tissue glue" group, the p-value is 0.93. This value is relatively high, suggesting that the observed difference in mean age between the

"Tissue glue" group and the "Traditional suturing" group is not statistically significant.

**Table 2: Gender-wise distribution of study groups**

Group	Male	Female	Total	df	CHI Square	P value
Tissue glue	15	10	25	1	0.577	0.44
Traditional suturing	17	8	25			
Total	32	18	50			

Table 2 compares two methods of wound closure (Tissue glue and Traditional suturing) in terms of their usage by males and females. Group column lists the two methods of wound closure being studied, which are Tissue glue and Traditional suturing. 15 males and 10 females used Tissue glue, while 17 males and 8 females used

Traditional suturing. In total, 25 individuals used Tissue glue, and 25 individuals used Traditional suturing. The CHI Square value is 0.577. The p-value is 0.44, which suggests that there may not be a statistically significant difference in the choice of wound closure method between males and females.

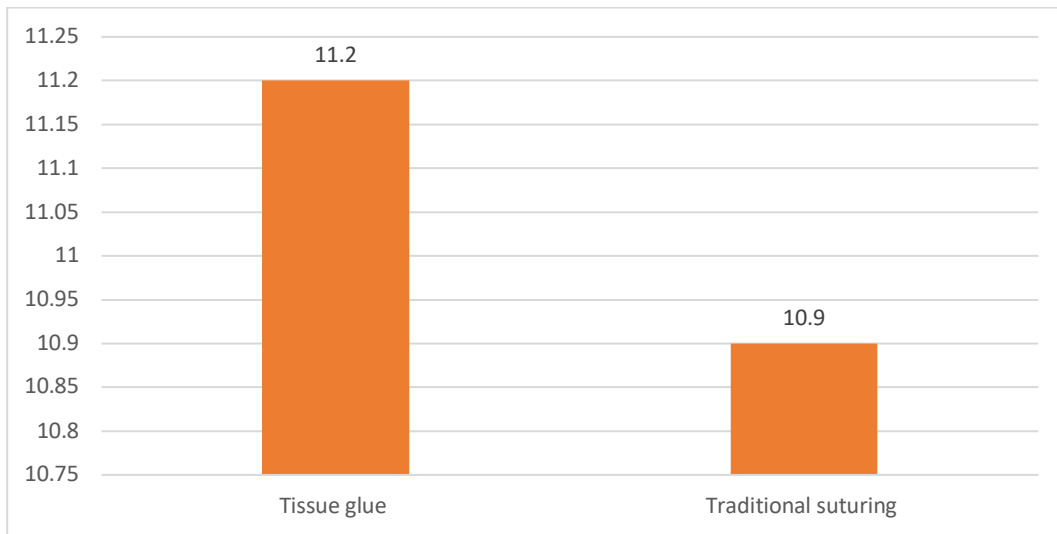
**Table 3: Postoperative pain score among study participants**

Tissue glue	25	3.37	0.3	0.001
Traditional suturing	25	5.39	0.4	

The results indicate that there is a significant difference between the two wound closure methods, Tissue glue and Traditional suturing, in terms of their effectiveness. Specifically, Tissue glue had a mean score of 3.37 with a standard deviation of 0.3, while Traditional suturing had a higher mean score of 5.39 with a standard deviation

of 0.4. The p-value associated with the comparison is very low (0.001), indicating strong statistical significance.

This suggests that tissue glue is significantly less post operative pain than traditional suturing as evidenced by the lower mean score



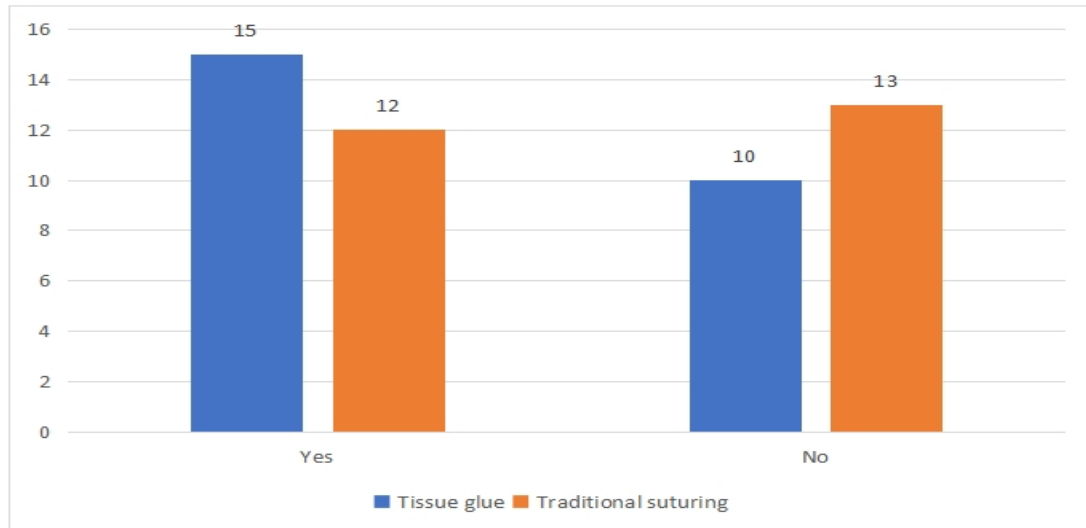
**Figure 1: Mean haemoglobin among study participants**

**Table 4: Comparison of duration of procedure among study participants**

Group	Number	Mean	S.D.	P value
Tissue glue	25	28.8	8.3	0.05
Traditional suturing	25	30.9	8.4	

The table compares the duration of the procedure between two groups, Tissue glue and Traditional suturing, among study participants. In the Tissue glue group, the mean duration of the procedure was 28.8 minutes, with a standard deviation of 8.3 minutes. In the Traditional suturing group, the mean duration was slightly longer at 30.9 minutes, with a standard deviation of 8.4 minutes. The p-value associated with this comparison is 0.05,

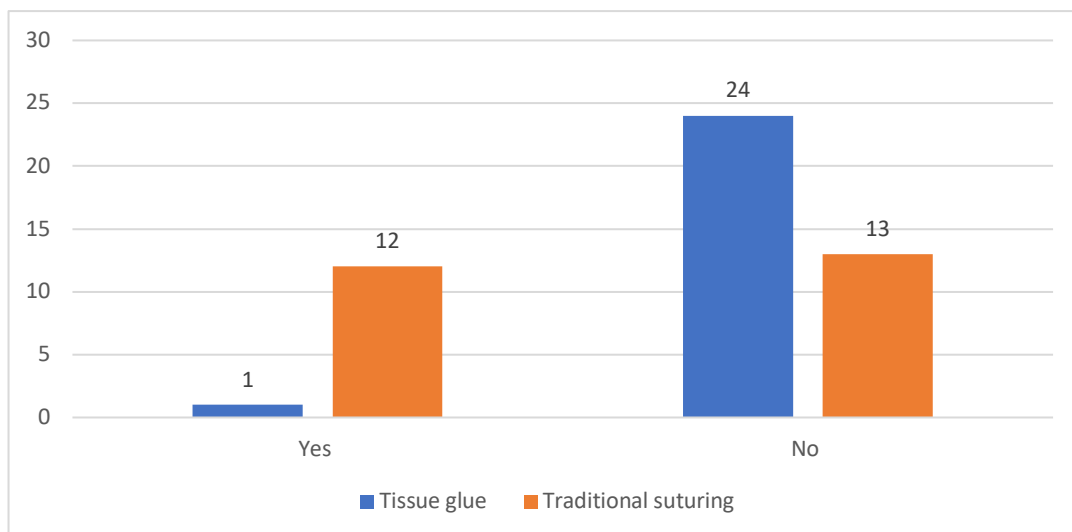
which suggests a borderline level of statistical significance. This indicates that there is a potential difference in the duration of the procedure between the two groups, with Traditional suturing having a slightly longer mean duration. However, the statistical significance is only borderline, so further investigation may be needed to confirm the difference.



**Figure 2: Diabetes mellitus among study participants**

Among the study participants it was observed that 15 patients in the tissue glue group and 12 patients in the traditional suturing group had diabetes mellitus; whereas 10 patients in the tissue glue

group and 13 patients in the traditional suturing group did not have diabetes mellitus. The association was not found to be statistically significant.



**Figure 3: Wound infection among study participants**

The incidence of wound infection was found to be more among patients who underwent traditional suturing when compared to those who underwent the use of tissue glue to manage the wound. The association was found to be statistically significant ( $P < 0.05$ ). This suggests that tissue glue group had significantly less risk of developing wound infection than traditional suturing as evidenced by the lower mean score.

#### Discussion

Shortly after being created, a full-thickness surgical incision undergoes the primary wound healing process, rapidly repairing the incision with precise alignment of its clean-cut edges. This minimizes

both contraction and irritation of the wound. Unlike subsequent wound healing methods, this initial process does not involve closure techniques. Instead, natural contraction and re-epithelialization allow the wound to heal independently. In comparison to the primary healing method, the secondary method triggers a more pronounced inflammatory response, leading to increased granulation tissue formation and a tighter wound closure.

A third method known as tertiary healing, or delayed primary closure, takes place after the primary closure has already taken effect. In this approach, healthy granulation tissue develops after

a period of wound resection. Secondary or tertiary wound closure techniques are applied to infected wounds resulting from trauma or other injuries.

Wound healing is a complex process influenced by the wound's environment and the patient's changing health condition. The duration of wound healing varies from several weeks to years after the initial injury. Numerous studies have explored and continue to explore the intricacies of the wound repair process. Various cell types are involved at different stages of healing, along with specific proteins and growth factors that aid in the repair.

Achieving proper tissue approximation is essential for closing the skin effectively. Ideal surgical techniques lead to satisfactory tissue reunion and cosmetically acceptable scars. Over time, advancements in wound closure methods have replaced early suture materials with more advanced resources like skin staplers, adhesive tapes, and skin glue.

The current study is a randomized controlled trial consisting of two groups, each with 25 participants. One group received treatment using tissue glue, while the other underwent traditional suturing. The postoperative pain scores were significantly better in the tissue glue group compared to the traditional suturing group (with a statistically significant association of  $P < 0.05$ ). Moreover, wound infection was more prevalent in the traditional suturing group than in the tissue glue group (also with a statistically significant association of  $P < 0.05$ ).

Utilizing a visual analogue scale to assess postoperative pain, Nipshagen MD et al. (2008) found that patients treated with tissue adhesive experienced notably less discomfort than those treated with skin sutures. The two groups displayed a statistically significant difference in mean VAS scores. Additionally, the skin suture group exhibited greater scarring than the tissue adhesive group, as evaluated by the Hollander Wound Evaluation Scale. Mean cosmesis scores also showed a statistically significant difference between the two groups.[9]

Chibbaro S. et al. (2009) conducted a study revealing identical cosmetic results between the tissue adhesive and skin suture groups. However, the tissue adhesive group displayed significantly higher patient satisfaction rates. Their analysis uncovered a substantial difference in patient satisfaction rates between the two closure methods. Tissue adhesive also boasted a considerably shorter average procedure time compared to skin sutures. The researchers concluded that tissue adhesive is a viable option for skin closure in various surgical procedures.[10]

Based on their meta-analysis of eight trials, Coulthard P et al. (2009) concluded that there was

no significant difference between tissue adhesives and skin sutures in terms of infection rates, wound healing time, scarring, or patient satisfaction.[11] In a review published in 2010, Wachter D et al. (2010) reported infection rates ranging from zero to twelve percent among the tissue adhesive group.[12]

Research by Fraeman KH et al. (2011) among patients who underwent coronary artery bypass grafting revealed that those treated with sutures or a combination of tissue adhesives and sutures had the lowest rates of superficial skin infections (SSIs).[13]

Huemer GM et al. (2012) studied the effectiveness of a self-adhering mesh and 2-octyl cyanoacrylate glue, proposing that their improved method was simple, safe, and well-received by patients. Among the reported issues, 1.8% of individuals experienced local allergic reactions.[14]

**Limitation:** The primary objective of this study was to investigate and assess the efficiency of tissue glue in comparison to conventional suturing for achieving proper skin approximation during wound closure. The study's constraints included the inability to employ tissue glue on contaminated or unclean wounds, as well as the relatively higher cost of tissue glue when compared to traditional suturing methods.

### Conclusion

Our research findings propose that tissue glue offers advantages over traditional suturing, particularly in the context of clean wounds. The two groups show similarities in terms of age, gender, mean haemoglobin levels, and diabetes status. Additionally, the average procedure duration is shorter in the tissue glue group. Furthermore, the tissue glue group demonstrates superior postoperative pain scores and a reduced incidence of wound infection. Although sutures have been utilized for centuries as a wound closure method and remain the most prevalent approach, they have transformed from rudimentary materials to specialized types tailored for specific tissues. Despite their widespread use, sutures also have inherent drawbacks. Notably, adhesive strips have emerged as notable alternatives. The exploration of causal relationships will require numerous forthcoming studies.

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