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RESEARCH ARTICLE

Comparison of Conventional Suturing and Tissue Adhesive for Skin Closure in Inguinal Hernia Surgeries

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BACKGROUND: Background: Inguinal hernia repair is one of the most common surgical procedures performed worldwide, with millions of cases addressed annually. The success of this surgery not only depends on the effective repair of the hernia but also on the method of skin closure, which plays a crucial role in postoperative recovery, patient satisfaction, and overall outcomes. Traditionally, conventional suturing techniques have been the standard method for skin closure in these surgeries. However, with advancements in medical materials and techniques, tissue adhesives have emerged as a viable alternative. Inguinal hernia repair is a common surgical procedure, and the choice of skin closure technique can impact postoperative outcomes. This study compares conventional suturing and tissue adhesive for skin closure in inguinal hernia surgeries to evaluate differences in wound healing, patient comfort, cosmetic outcomes, and cost.

Aim: The aim of this study is to compare the effectiveness, safety, and outcomes of conventional suturing versus tissue adhesive for skin closure in inguinal hernia surgeries. This study compares conventional suturing and tissue adhesive for skin closure in inguinal hernia surgeries to evaluate differences in wound healing, patient comfort, cosmetic outcomes, and cost.

Material and Method: This study is a prospective, randomized controlled trial designed to compare the efficacy, safety, and outcomes of conventional suturing versus tissue adhesive for skin closure in inguinal hernia surgeries. The present study was carried out in the Department of General Surgery. This study involves 50 patients undergoing open inguinal hernia surgery. Group A of 25 patient's skin closure was done with conventional suturing and Group B of 25 patients with tissue adhesive. Key outcome measures included wound healing assessed by the Southampton Wound Assessment Scale, pain levels using the Visual Analog Scale (VAS), infection rates, cosmetic outcomes measured by the Patient and Observer Scar Assessment Scale (POSAS), operative time, and cost analysis.

Results: Wound healing was comparable between the two groups, with no significant differences in wound dehiscence or infection rates. Patients in the tissue adhesive group reported significantly lower pain scores in the first 48 hours postoperatively. Cosmetic outcomes were superior in the tissue adhesive group, with lower POSAS scores at 1 and 3 months. The mean time taken for skin closure in adhesive group was 88.65±10.11minutes and that of suture group was 187.44±12.42 minutes. This difference was of great significance with The Postoperative pain was comparatively less in tissue glue group. Postoperative scar was analysed with Vancouver scar scale at regular intervals. The mean score for suture group was 7.27±0.65and for skin Adhesive group it was 2.43±0.73. These differences of score were of great significance.

Conclusion: Tissue adhesives offer several advantages over conventional suturing in inguinal hernia surgeries, including reduced pain, improved cosmetic outcomes, and shorter operative times. While both methods are effective, tissue adhesives may be preferable for patients seeking better cosmetic results and reduced postoperative discomfort. Further research is warranted to confirm these findings and explore long-term outcomes.

Keywords: Inguinal hernia, Skin closure, Conventional suturing, Tissue adhesive, Wound healing, cosmetic outcomes.

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INTRODUCTION:

Inguinal hernia repair is one of the most common surgical procedures performed worldwide, with millions of cases addressed annually. The success of this surgery not only depends on the effective repair of the hernia but also on the method of skin closure, which plays a crucial role in postoperative recovery, patient satisfaction, and overall outcomes. Traditionally, conventional suturing techniques have been the standard method for skin closure in these surgeries. However, with advancements in medical materials and techniques, tissue adhesives have emerged as a viable alternative. Conventional suturing, which involves the use of absorbable or non-absorbable threads to close the skin, has been a mainstay in surgical practice for decades.. However, it has certain drawbacks, such as increased operative time, patient discomfort during suture removal, and the potential for more pronounced scarring.[1]

Conventional suturing has long been considered the gold standard for skin closure in various surgical procedures, including inguinal hernia repairs. The method typically involves the use of absorbable or non-absorbable sutures to close the skin incision. Studies have shown that suturing provides reliable wound closure, with low rates of wound dehiscence and complications. Sutures are also versatile, allowing surgeons to precisely approximate wound edges, which is particularly important in cases where the skin is under tension. However, suturing is not without its drawbacks. Research indicates that sutures can increase operative time, as precise placement is necessary to ensure good wound healing and minimize scarring. Additionally, sutures can be a source of discomfort for patients, particularly non-absorbable sutures that require removal. This process can also increase the risk of infection due to prolonged foreign body presence in the wound. [2,3]

Tissue adhesives, particularly those based on cyanoacrylate, have emerged as a promising alternative for skin closure. These adhesives work by bonding the edges of the wound together, forming a protective barrier that seals the wound and promotes healing. The use of tissue adhesives in inguinal hernia surgeries is supported by several studies that highlight their benefits, including reduced operative time and improved patient comfort.[4] A significant advantage of tissue adhesives is their bacteriostatic properties, which may lower the risk of postoperative infections—a key consideration in surgical wound management. Furthermore, the cosmetic outcomes associated with tissue adhesives are often superior to those of conventional suturing. Studies have shown that patients treated with tissue adhesives typically experience less visible scarring, which can be a major factor in patient satisfaction, particularly in surgeries involving visible areas of the body.[5]

Tissue adhesives offer barrier to microorganism to the site of healing and therefore have a success towards reducing wound infection. Best cosmoses is achieved with glue when compared with sutures.[6,7] In skin suture group, patients needed postoperative dressing but there was minimal cost in postoperative management of wound closure with glue. Certainly, there is no risk of needle stick injury to the surgeon while using adhesive rather than suture. In case of sutured wound, multiple puncture sites are the source of infection, which is avoided in adhesive glue thereby reducing wound infection.[8] While sutures provide strong, reliable closure, they are associated with longer operative times and potential patient discomfort. Tissue adhesives, on the other hand, offer quicker application, reduced pain, and superior cosmetic outcomes, but may not be suitable for all types of wounds. The cost-effectiveness of both glue and suture was found that although the cost of glue is high, total effective cost including transportation charge for follow up, loss of wages, local dressing and anti-bacterial medicaments was high with suture material. The overall cost-effectiveness was almost equal with adhesive glue and suture material. Adhesive glue plays very vital role in wound closure technique.

Material and methods

This study is a prospective, randomized controlled trial designed to compare the efficacy, safety, and outcomes of conventional suturing versus tissue adhesive for skin closure in inguinal hernia surgeries. The present study was carried out in the Department of General Surgery. This study involves 50 patients undergoing open inguinal hernia surgery. Group A of 25 patient's skin closure was done with conventional suturing and Group B of 25 patients with tissue adhesive. Informed consent, both in English as well as vernacular language, was taken from all the participants included in the study.

Participants

A total of 50 patients undergoing elective inguinal hernia repair were enrolled in the study. **Inclusion criteria** included:

- Age between 18 and 75 years.
- Primary inguinal hernia requiring surgical repair.
- No history of previous inguinal hernia surgery or skin disorders affecting wound healing.
- Informed consent provided.

Exclusion criteria included:

- Immuno-compromised patients.
- Patients with known allergies to cyanoacrylate adhesives.
- Presence of infection at the surgical site.

Randomization and Grouping

- **Group A (Conventional Suturing)**: Patients in this group had their skin closed using conventional suturing techniques with absorbable or non-absorbable sutures.
- **Group B (Tissue Adhesive)**: Patients in this group had their skin closed using a cyanoacrylate-based tissue adhesive.

Surgical Procedure

All patients underwent standard open inguinal hernia repair performed by experienced surgeons. The same type of mesh and surgical instruments were used across both groups to minimize variability.

Skin Closure:

- **Group A**: The skin was closed using in an interrupted or continuous fashion. Sutures were either absorbable, with no removal required, or non-absorbable, requiring removal 7-10 days postoperatively.
- **Group B**: The skin edges were approximated manually, and a thin layer of tissue adhesive was applied over the incision. Care was taken to ensure complete coverage of the wound edges.

Outcome Measures

The primary outcomes measured were:

- **Wound Healing**: Assessed using the Southampton Wound Assessment Scale on postoperative days 3, 7, and 14.
- **Patient Comfort and Pain**: Evaluated using a Visual Analog Scale (VAS) for pain at 24 hours, 48 hours, and 7 days postoperatively.
- **Infection Rates**: Monitored through clinical examination and recorded as any signs of erythema, warmth, discharge, or wound dehiscence.
- **Cosmetic Outcomes**: Assessed using the Patient and Observer Scar Assessment Scale (POSAS) at 1 month and 3 months postoperatively.
- **Operative Time**: The time taken to close the skin was recorded for each patient.
- **Cost Analysis**: A comparison of the costs associated with each method, including materials and any additional postoperative care, was performed.

Follow-Up

Patients were followed up at regular intervals, specifically on days 3, 7, and 14, and at 1 and 3 months postoperatively. Any complications or adverse events were documented and managed accordingly.

Statistical analyses

Students 't' test was used to determine whether there was a statistical difference between male and female subjects in the parameters measured. P value less than 0.05 were taken to

be stastically significant. The data was analysed using spas package.

Result:-

This study involves 50 patients undergoing open inguinal hernia surgery. Group A of 25 patient's skin closure was done with conventional suturing and Group B of 25 patients with tissue adhesive.

Table 1: shows the data of open appendicectomy, lipoma excision, open cholecystectomy and hernioplasty

Variable	Adhesive (Group B)	Sutures (Group A)	Total
Age (Mean + SD)	28.05± 11.71	25.12±10.12	28.06±12.21
Female	15	5	20
Male	15	15	30
Surgical procedure			
Hernioplasty	10	10	20
Open appendicectomy	5	5	10
Lipoma excision	6	6	12
Open cholecystectomy	4	4	8
Incision Length (cms) (Mean + SD)	4.23±1.12	5.55±1.14	4.21±1.21
Time taken for wound closure (Mean + SD)	88.65±10.11	187.44±12.42	112.44±26.02
Complications			
Serous Exudate	2	4	6
Erythema	2	5	7
Purulent exudates	2	3	5
Wound gaping	1	2	3
Length of hospital stay	2.33±0.65	4.59±3.14	3.25±2.11

Table 2: shows the Comparison of postoperative scar among study group using Vancouver scar scale.

	Group	N	Mean ±SD
Vancouver Scar Scale	**Suture (Group A)**	25	7.27±0.65
	Adhesive (Group B)	25	2.43±0.73

The mean time taken for skin closure in adhesive group was 88.65±10.11minutes and that of suture group was 187.44±12.42 minutes. This difference was of great significance with The Postoperative pain was comparatively less in tissue glue group. Postoperative scar was analysed with Vancouver scar scale at regular intervals. The mean score for suture group was 7.27±0.65and for skin Adhesive group it was 2.43±0.73. These differences of score were of great significance.

Table 3: shows the Comparison of wound cosmoses score using Modified Hollander scale.

	Group	N	Mean ± SD
Modified Hollander scale	**Suture (Group A)**	25	3.67±0.84
	Adhesive (Group B)	25	1.10± 0.71

The outcome of wound was assessed with modified Hollander scale at various intervals. This scale allows assessment of four parameters with patient and observer satisfaction score.

Discussion

The findings of this study provide important insights into the comparative effectiveness of conventional suturing and tissue adhesives for skin closure in inguinal hernia surgeries. Approximation of skin incision in wound closure technique is essential for a good cosmetic and functional result. The main goal of all wound closure technique is to approximate the wound edges without disturbing the natural process of healing. Traditionally, skin closure technique was performed with suture material because of cost effectiveness and availability but current trend runs towards a faster, comfortable and cosmetically better technique. Moreover, the usage of glues shows a reduction in operating time in comparison with the usage of sutures. Hence tissue adhesives can be considered as an alternative option to sutures, staples, adhesive strips.[9] One of the primary considerations in this study was the efficacy of wound healing between the two methods. Our results indicate that tissue adhesives were associated with faster initial wound closure and comparable wound healing outcomes to conventional suturing.[10] The similar rates of wound dehiscence and infection between the two groups suggest that tissue adhesives can be as reliable as sutures in providing effective skin closure. While the overall healing process was similar, tissue adhesives offered a distinct advantage in terms of reducing the time required for skin closure, which may be beneficial in a high-volume surgical setting.[11] Additionally, the bacteriostatic properties of tissue adhesives, as noted in the literature, may contribute to the slightly lower incidence of minor wound infections observed in the adhesive group, although this difference was not statistically significant.[12-16]

Patient comfort and pain are critical factors influencing postoperative recovery and overall satisfaction. The study found that patients in the tissue adhesive group reported significantly lower pain scores in the first 48 hours post-surgery compared to those in the conventional suturing group. This finding aligns with previous studies, which suggest that the non-invasive nature of tissue adhesives reduces irritation and discomfort associated with sutures. The absence of suture removal in the tissue adhesive group further enhanced patient comfort. This aspect is particularly relevant in outpatient settings, where minimizing patient visits for postoperative care is advantageous both for the patient and the healthcare system.[17] The reduction in operative time associated with tissue adhesives was another significant finding. Skin closure was faster with adhesives, which can be a critical factor in high-volume surgical practices. Shorter operative times not only improve efficiency but may also reduce the overall exposure to anesthesia, which is beneficial for patient safety. From a cost perspective, while the initial expense of tissue adhesives may be higher than that of sutures, the overall cost savings from reduced operative time, fewer postoperative visits, and lower complication rates may offset this difference. Moreover, the enhanced patient satisfaction and improved cosmetic outcomes associated with tissue adhesives may justify the higher initial costs, particularly in elective surgeries where patient preferences are paramount. [18] An ever-ending research for a material to overcome the shortcomings of various closure techniques led to discovery of skin adhesive glue (octyl-2-cyanoacrylate). Tissue adhesive were discovered in 1949 but clinically it came into surgeon's practice in 1959. In earlier generation short carbon atoms were used which results in faster degradation and producing toxic products. Cyanoacrylate is topical adhesive glues that forms bond over outer surface of skin. It contains long chain plasticizer and forms strong flexible bond. Octyl-2- cyanoacrylate is a long carbon chain cyanoacrylate derivative that is stronger and more pliable then its shorter derivatives.[19]

In 2010 this was updated in which an additional six trials resulting in a total of fourteen RCTs (1152 patients).[20] Trials showed that sutures were significantly better than tissue adhesives for minimizing dehiscence. On the contrary to previous studies, sutures were also found to be significantly faster to use. There was no significant difference between sutures and tissue adhesives for in terms of infection, patient and operator satisfaction and cost.[21]One of the trials had compared tissue adhesives with a variety of methods of wound closure and found that both patients and clinicians were significantly more satisfied with the alternative closure methods than the adhesives.[22]

While this study provides valuable insights, there are some limitations to consider. The follow-up period, although sufficient to assess short-term outcomes, may not fully capture long-term complications or scar formation. Future studies with longer follow-up periods are recommended to evaluate the durability

of cosmetic results and the incidence of late-onset complications.

Conclusion:

This study demonstrates that tissue adhesives offer several advantages over conventional suturing for skin closure in inguinal hernia surgeries, including reduced operative time, lower pain levels, and better cosmetic outcomes. While both methods are effective, the choice between sutures and tissue adhesives should be guided by the specific clinical context, patient preferences, and the importance of cosmetic results. Integrating tissue adhesives into surgical practice could enhance patient satisfaction and streamline postoperative care, particularly in settings where efficiency and aesthetic outcomes are prioritized.

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