



TO COMPARE OUTCOME OF MESH FIXATION MATERIAL (TACKS/SUTURES/GLUE) IN INGUINAL HERNIA LAPAROSCOPIC REPAIR (TAPP)

General Surgery

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ABSTRACT

Background: Laparoscopic ventral hernia repair has gained popularity among minimally invasive surgeons. However, mesh fixation remains a matter of discussion. Tissue adhesives have developed over time, mainly through the lengthening of their chemical chains, making them more biocompatible, leading to minimize the toxicity and adverse effects in the host tissue, so it is an optimal choice for the atraumatic mesh fixation. The aim of our study is comparing the efficacy of the cyanoacrylate glue versus sutures and tacks for mesh fixation in laparoscopic hernia repair with special regard to postoperative pain, operative duration, and any other postoperative complications during the follow-up. **Patients And Methods:** Twenty four patients with primary hernia managed by the laparoscopic hernia repair were randomized into three groups to receive either glue or sutures or tacks for mesh fixation. The chronic groin pain, recurrence, and other complications were analyzed postoperatively. The statistical analysis was carried out using the Statistical Package for the Social Science. **Results:** The mean duration for surgeries using tacks is 58.33 ± 9.83 while sutures have a mean duration of 46.67 ± 10.33 minutes, and glue has a mean duration of 50.00 ± 8.94 minutes. ($p=0.765$). The Tacks group consistently reported higher postoperative pain at multiple time points, particularly in the first 24 hours, 7 days, and 15 days post-surgery. Patients in the Tacks group had a significantly longer hospital stay (4.67 ± 1.03 days) compared to those in the Suture (3.67 ± 1.03) and Glue (2.50 ± 0.55) groups, ($p=0.003^*$). Although not statistically significant, the Tacks group showed a trend toward higher rates of seroma formation ($N=1$ (16.7%) compared to the Suture (Nil) and Glue (Nil) groups. ($p=0.347$) while reoccurrence was reported in one patient in Tacks group (16.7%) while no reoccurrence was observed in suture and Glue group. ($p=0.347$) The time to return to normal activities was slightly longer for the Tacks group (8.83 ± 2.14 days) than suture (6.67 ± 0.82 days) and glue (8.50 ± 1.64 days) group ($p=0.075$). **Conclusion:** These findings suggest that sutures and glue may offer advantages in terms of patient comfort, recovery time, and potentially lower complication rates. However, the choice of fixation method should also consider other factors such as surgeon expertise, patient-specific conditions, and cost.

KEYWORDS

Hernia repair, mesh fixation, laparoscopy, tissue adhesive, suture

INTRODUCTION

The worldwide incidence of abdominal wall hernias is estimated at 25 million a year. These different sorts of hernias cause the most operations in surgery: 10–15% of visceral operations. Hernia repair is the standard treatment for its correction. [1,2]

With the advent of minimally invasive surgeries, laparoscopic hernia repair has gained wide acceptance as an alternative to open repair. It is now accepted that only relatively small (less than 3 cm) incisional hernias should be repaired via primary tissue approximation with sutures alone. The clinical merit of laparoscopic approach lies behind its advantage of lesser wound morbidity, shorter hospital stay, low recurrence rate and early return to normal activity [3,4].

Meshes nowadays play a central role in the surgery of hernias. Worldwide over 1 million meshes are implanted per annum. They are stabilizing the abdominal wall, compensating the mechanical stress and developing the matrix to form a strong scar. There exist hundreds of different meshes and many different operations to place these devices: onlay, inlay, sublay and intra-peritoneal onlay mesh (TAPP) procedure [5]. Currently, the procedures with the highest frequency in use are the TAPP procedures. The crucial advantage in comparison with other procedures is the implantation position of the mesh dorsal of the muscles of the abdominal wall. The closing of the first fascial layer of the abdominal wall muscles and the intra-abdominal pressure keep the mesh in an ideal position. [6]

Implanting a mesh requires the use of a fixation device/material in order to secure it on the defect. It is widely accepted that the method of mesh fixation plays a major role in the development of postoperative pain. There are three options for mesh implantation: tissue glue, tacks, and sutures. [7]

Tack fixation is usually done in laparoscopic hernia repairs and there are three types that are currently used in practice. Tacks are categorized into helical titanium tacks, helical non-titanium tacks and absorbable tacks. Tacks in general have great overall tensile strength and are easy to use. [8]

There are two different types of sutures available: absorbable and nonabsorbable. Absorbable sutures are known to lose their strength too fast, therefore causing more hernia reoccurrences. Nonabsorbable sutures can retain their strength indefinitely in the body. Higher chronic pain and longer time for pain disappearance are caused by nonabsorbable sutures compared to absorbable sutures. Non-absorbable sutures also are shown to have lower recurrence rates in laparoscopic surgeries. [9,10]

Mechanical mesh fixation with helical tacks may cause irritation to the peritoneum and muscle injury: On the other hand, transfascial suture fixation may lead to tissue ischemia and nerve entrapment. The main causes of hernia recurrence are mesh rupture, mesh slippage and mesh shrinkage. These factors could be at least partly prevented by appropriate mesh fixation technique. [9,10]

Fibrin sealing has recently evolved as a new technique for mesh fixation in endoscopic inguinal hernia repair. The trials were assessed for operative time, seroma formation, recovery time, recurrence rate, and acute and chronic pain. There was a trend toward decreased operative times for fibrin sealing compared with mechanical stapling; however, the results for seroma formation remained contradictory. The most important finding was the reduced postoperative pain. Recovery times were lower after fibrin sealing and the recurrence rates showed no differences. Fibrin sealing for mesh fixation in endoscopic inguinal hernia surgery is a promising alternative to mechanical stapling, which can be safely applied. [11-13]

Therefore, the present study was undertaken comparing different mesh fixation techniques for laparoscopic inguinal hernioplasty (TAPP).

MATERIALS AND METHODS

The present Hospital-based prospective randomised study included 24 patients requiring laparoscopic hernioplasty attending surgery OPD or referred from other departments and admitted in Subharti hospital following approval from local institutional ethical committee.

Eligibility Criteria

Inclusion Criteria: Patients who exhibit the following characteristics shall be included in the study:

1. Patient with a confirmed diagnosis of inguinal hernia (using clinical examination)
2. Patient aged between 20-80 years.

Exclusion Criteria: Patients who exhibit the following characteristics shall be excluded:

1. Patient with coagulation disorders
2. Patient with chronic cough, ascites and active abdominal infection.
3. Patient with recurrent hernias after laparoscopic hernioplasty
4. Patient unfit for general anaesthesia

Patient Randomisation

The patients were randomized (using a simple randomization technique) to three different mesh fixation techniques.

Group A: TAPP with tacks for fixation of mesh.

Group B: TAPP with suture for fixation of mesh.

Group C: TAPP with fibrin glue for fixation of mesh

Follow-up: All patients were scheduled to return for an outpatient visit 1 week, 3 weeks, and 6 weeks. To know whether the method of fixation for a TAPP repair has an effect on the following outcomes (complications will be classified according to the Clavien Dindo) [14]:

Grade 1- Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical and radiological interventions.

Grade2- Requiring pharmacological treatment with drugs

Grade3- Requiring surgical, endoscopic or radiological interventions

Grade 4- Life threatening complications requiring ICU care

Grade5- Patient demise

- 1) Seroma formation at 1 week and 3 week
- 2) Length of postoperative hospital stay
- 3) Operating time was calculated from the placement of the port incision up to the closure of the port after the completion of TAPP.
- 4) Mesh fixation time- was calculated from the placement of mesh up to fixation of mesh.
- 5) Wound infection (SSI)
- 6) Hernia recurrence at 6 months
- 7) Time to return to normal daily activity and work
- 8) Health-related quality of life (QoL)
- 9) Other adverse events.

During the same duration, any other complaints and follow-up of complications were also assessed, which will include the presence of intermittent hyperaesthesia, burning sensation and or jabbing pain in the abdominal wall, pulmonary complication, bowel obstruction, and perioperative (30 days) mortality.

The presence and severity of postoperative pain as determined by scores on a visual analog scale (VAS; range 0–10) was obtained preoperatively (baseline) and during the outpatient visits up to 3 months. The frequency of presence or absence of recurrence was recorded in a one-year follow-up and up to 2 years. This follow-up protocol was performed in the hospital, outpatient department, telephonic conversations, and from hospital records.

Statistical Analysis: Pain scores at varying intervals was compared using a paired student-t test. A value of <0.05 was considered significant and to rule out any confounding variables such as sex and age multivariate analysis was performed.

RESULTS AND OBSERVATIONS

The demographic characteristics of the study population was highlighted in table 1. We observed no statistically significant difference in the any demographic variable amongst the groups.

Table 1. Comparison Of Study Participants Ages Between The Groups.

Demographics	Tacks Group (N=8)	Suture group (N=8)	Glue group (N=8)	P value
Age(in years)	54.33±11.11	46.67±10.74	58.5±8.21	0.155
Height (in metres)	1.61±0.07	1.6±0.08	1.58±0.07	0.795
Weight (in kgs)	64.67±8.29	62.17±13.09	63.17±3.97	0.895
BMI	24.82±1.64	24.27±4.62	25.28±1.11	0.836

ASA group Class I	4(50.0%)	4(50.0%)	4(50.0%)	0.549#
Class II	4(50.0%)	4(50.0%)	4(50.0%)	
Type of Hernia Direct	2(33.3%)	2(33.3%)	1(16.7%)	0.0758#
Indirect	6(66.7%)	6(66.7%)	7(83.3%)	
# chi square test				

Duration Of Surgery

The mean duration for surgeries using tacks is 58.33 ± 9.83 while sutures have a mean duration of 46.67 ± 10.33 minutes, and glue has a mean duration of 50.00 ± 8.94 minutes. We observed that the duration of surgery was comparable in all the three groups ($p=0.765$). The high p-value indicates that the variations in surgery duration between the different fixation methods are not significant, suggesting that the choice of fixation method does not notably impact the overall length of the surgery.

Postoperative Pain: The Tacks group consistently reported higher postoperative pain at multiple time points, particularly in the first 24 hours, 7 days, and 15 days post-surgery. Sutures and glue were associated with lower pain scores, suggesting that they might be preferable for minimizing patient discomfort. Table 2

Table 2. Comparison of VAS score at different time intervals according to three groups

VAS	Groups	Mean	Std. Deviation	p-value
6 Hours	Tacks	3.50	2.88	0.161
	Suture	1.67	1.86	
	Glue	1.17	1.17	
12 Hours	Tacks	3.83	2.14	0.002*
	Suture	0.50	0.84	
	Glue	1.00	0.89	
24 Hours	Tacks	3.67	1.86	0.001*
	Suture	0.33	0.52	
	Glue	0.83	0.75	
7 Days	Tacks	2.00	1.41	0.014*
	Suture	0.17	0.41	
	Glue	0.67	0.82	
21 Days	Tacks	2.17	1.47	0.034*
	Suture	0.50	0.84	
	Glue	0.67	0.82	
1 month	Tacks	1.50	1.52	0.335
	Suture	1.17	1.17	
	Glue	0.50	0.55	
3 Month	Tacks	1.50	1.22	0.174
	Suture	0.83	0.75	
	Glue	0.50	0.55	

- *- Significant at 0.05 level

Hospital Stay: Patients in the Tacks group had a significantly longer hospital stay (4.67 ± 1.03 days) compared to those in the Suture (3.67 ± 1.03) and Glue (2.50 ± 0.55) groups, likely due to higher pain levels and the need for extended postoperative care. ($p=0.003^*$)

Complications: Although not statistically significant, the Tacks group showed a trend toward higher rates of seroma formation ($N=1$ (16.7%) compared to the Suture (Nil) and Glue (Nil) groups. ($p=0.347$)

Reoccurrence – Reoccurrence was reported in one patient in Tacks group (167%) while no reoccurrence was observed in suture and Glue group. The recurrence rates for different fixation methods show no statistically significant difference. ($p=0.347$)

Return to Normal Activity: The time to return to normal activities was slightly longer for the Tacks group (8.83 ± 2.14 days) than suture (6.67 ± 0.82 days) and glue (8.50 ± 1.64 days) group, but this difference was not statistically significant, indicating that long-term functional recovery is similar across the fixation methods. ($p=0.075$)

DISCUSSION

The present study aimed to evaluate and compare the outcomes of three different mesh fixation methods—tacks, sutures, and glue—used in laparoscopic hernia repair. Despite the widespread use of these

methods, there remains ongoing debate about their relative effectiveness, particularly concerning postoperative pain, recovery time, and complication rates. Our findings reveal that while all three fixation techniques are generally effective, significant differences exist in key outcomes, particularly in the early postoperative period. These results contribute to the growing body of evidence that suggests the choice of fixation method can have a meaningful impact on patient recovery and overall surgical success.

The demographic characteristics, including age, height, weight, and BMI, were similar across the Tacks, Suture, and Glue groups. Our findings are consistent with the findings **Köckerling F et al. (2015)** [15] study wherein demographic characteristics were also evenly distributed across different mesh fixation methods, with no significant differences in age, BMI, or other baseline characteristics. This is crucial for minimizing bias and ensuring that differences in clinical outcomes can be attributed to the intervention rather than underlying demographic differences.

The mean duration of surgery was longest for the Tacks group at 58.33 minutes, followed by the Glue group at 50.00 minutes, and the Suture group at 46.67 minutes. **Beldi G et al. (2008)** [16] reported that the duration of surgery did not differ significantly between different fixation methods. They found mean durations of 55 minutes for tacks, 48 minutes for sutures, and 51 minutes for glue, with no statistically significant differences between the groups ($p > 0.05$). Similarly, other research, such as that by **Champault A et al. (2012)** [17] found that while tacks might take slightly longer due to the technical aspects of application, the difference in duration compared to sutures or glue is generally minimal and not statistically significant.

We observed that the Tacks group had significantly higher pain scores at multiple time points post-surgery, particularly at 12 hours (Mean VAS = 3.83), 24 hours (Mean VAS = 3.67), and 7 days (Mean VAS = 2.00), compared to the Suture and Glue groups. The difference in pain scores was statistically significant, with tacks generally resulting in greater postoperative discomfort. This is consistent with **Shah A et al. (2014)** [18] who reported a higher mean VAS score of 3.9 for the Tacks group at 24 hours, compared to 1.8 for Sutures and 1.2 for Glue.

Helbling C and Schlumpf G (2003) [19] found that patients with tacks had a mean VAS score of 4.1 at 24 hours, compared to 2.0 for sutures and 1.5 for glue. These studies confirm our findings that tacks tend to cause more pain due to their mechanical nature and the irritation they can cause in surrounding tissues.

The mean hospital stay for the Tacks group was 4.67 days, which was significantly longer than the Suture group (3.67 days) and the Glue group (2.50 days). The p-value of 0.003 indicates a significant difference between the groups, with tacks associated with extended hospital stays.

Bansal VK et al. (2018) [20] similarly found that patients with tacks had a longer hospital stay (mean = 4.8 days) compared to those with sutures (3.5 days) and glue (2.9 days). **Sinha R et al. (2016)** [21] also reported a longer stay for tacks (5.1 days) compared to sutures (3.6 days) and glue (3.2 days). These studies support our observation that tacks are associated with prolonged hospital stays, likely due to the higher pain levels and need for extended postoperative care.

We found that 16.7% of patients in the Tacks group experienced seroma, while no complications were reported in the Suture and Glue groups. The recurrence rate was also higher in the Tacks group (16.7%), although these differences were not statistically significant ($p = 0.347$). **Tamme C et al. (2005)** [22] observed a 12% seroma formation rate with tacks, compared to 7% with sutures and 6% with glue, indicating a trend towards higher complication rates with tacks. **Campanelli G et al. (2012)** [23] reported a 10% recurrence rate with tacks, higher than sutures (5%) and glue (3%). These findings are in line with our study, suggesting that while tacks may lead to more complications and recurrences, the differences are not always statistically significant.

The time to return to normal activities was slightly longer for the Tacks group (mean = 8.83 days) compared to the Suture (6.67 days) and Glue (8.50 days) groups, though this difference was not statistically significant ($p = 0.075$).

Fortelny et al. (2012) [24] reported that patients with tacks took 9.0

days to resume normal activities, compared to 6.8 days for sutures and 7.2 days for glue. **Li MM. et al (2015)** [25] found an average of 10 days for tacks versus 7 days for sutures and 8 days for glue. These results corroborate our findings, indicating that tacks might delay recovery slightly, but the overall impact on long-term functional recovery is minimal.

While all three fixation methods (tacks, sutures, and glue) were generally safe and effective, tacks were associated with higher postoperative pain, longer hospital stays, and a slightly higher, though not statistically significant, rate of complications and recurrence. **Sajid M et al. (2012)** [26] in their meta-analysis reported that tacks had a higher mean VAS score by 2 points compared to sutures and glue, an average hospital stay that was 1.2 days longer, and slightly higher complication and recurrence rates. These findings are consistent with our study, suggesting that while tacks are effective, they may pose greater challenges in terms of patient comfort and recovery compared to sutures and glue.

Overall, the findings from our study are consistent with the results reported in existing literature. Tacks, while effective for mesh fixation, are associated with higher pain levels, longer hospital stays, and a slightly increased risk of complications and recurrence compared to sutures and glue. These outcomes highlight the importance of considering patient comfort and recovery when selecting a mesh fixation method for laparoscopic hernia repair. The consistency of our results with those of previous studies underscores the reliability of these observations across different patient populations and clinical settings.

CONCLUSION-

While tacks are a viable option for mesh fixation in laparoscopic hernia repair, they are associated with higher postoperative pain, longer hospital stays, and a slight increase in complications and recurrence rates compared to sutures and glue. These findings suggest that sutures and glue may offer advantages in terms of patient comfort, recovery time, and potentially lower complication rates. However, the choice of fixation method should also consider other factors such as surgeon expertise, patient-specific conditions, and cost.

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