International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 12, December 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.12.2024.122

ORIGINAL RESEARCH

Glue versus Tacker for Mesh Fixation in Inguinal Hernia Surgery: A Comparative Study

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Received: 11 November, 2024 Accepted: 23 December, 2024

ABSTRACT

Background: The introduction of mesh marked a significant advancement in hernia surgery. It is theorized that mechanical mesh fixation techniques may result in greater tissue damage compared to nonmechanical approaches. This study was designed to evaluate the clinical outcomes of mesh fixation using fibrin glue, a nonmechanical method, compared with tackers in totally extraperitoneal (TEP) repair of unilateral inguinal hernia. **Materials and Methods:** A single-blinded, randomized controlled trial was conducted on individuals diagnosed with unilateral, uncomplicated inguinal hernia, with a hernial sac measuring no more than 5 cm, were eligible for inclusion. A total of 78 participants were randomized into two groups prior to mesh fixation. In group A, mesh fixation was performed with tackers, whereas in group B, fibrin glue was employed for the procedure. Patients were followed up prospectively for a period of three months. **Results:** No statistically significant differences were observed between the groups regarding operative duration. However, the fibrin glue group demonstrated shorter average hospital stays. Postoperative complications, including urinary retention, seroma, and hematoma formation, showed no notable differences between the groups. Patients in the fibrin glue group resumed their regular activities earlier compared to those in the tacker group. **Conclusion:** Considering the superior outcomes and cost-effectiveness associated with the fibrin glue fixation technique, it is recommended as a preferable alternative to tackers for mesh fixation in TEP repair of hernias.

Key Words: Laparoscopy, hernia, tacker, glue

INTRODUCTION

Hernias have been recognized as a longstanding surgical condition primarily managed by surgeons. They develop in areas of muscular weakness or through potential anatomical defects in the human body. Among hernias, inguinal types are particularly prevalent in clinical practice. These are categorized as indirect (where the contents come out through the deep ring), direct (where the contents herniate medially to the deep ring), or pantaloon hernias (featuring both direct and indirect components). Inguinal hernias may present unilaterally or bilaterally [1,2].

Hernia repair surgery has progressed significantly, transitioning from simple defect repairs to reinforcing the abdominal wall using prosthetic materials. Tissue-based repair techniques were previously associated with high recurrence rates, presenting a considerable challenge for surgeons dealing with recurrent cases. The introduction of mesh reinforcement marked a pivotal advancement in hernia surgery. Meta-analyses have consistently demonstrated the superiority of mesh repair over suture-based methods [3-6].

A diverse range of meshes, differing in physical and chemical properties, is now available for hernia repair [4]. The evolution of surgical techniques has mirrored these advancements, moving from open surgery to minimally invasive approaches. Minimally invasive methods offer several benefits, including faster postoperative recovery, smaller hospital stays, and faster return to routine activities. Additionally, they cause less postoperative pain due to smaller incisions,

DOI: 10.69605/ijlbpr_13.12.2024.122

while maintaining recurrence rates comparable to open surgery [6]. However, the adoption of minimally invasive techniques is associated with high equipment costs and a significant learning curve for surgeons. The two widely used minimally invasive procedures for inguinal hernia are totally extraperitoneal repair (TEP) and transabdominal preperitoneal repair (TAPP).

In laparoscopic hernia surgical repair, mesh fixation methods are broadly categorized into mechanical and nonmechanical ones [7]. Mechanical techniques encompass sutures and tissue-penetrating fixation devices such as tackers. Conversely, nonmechanical methods include self-gripping meshor tissue adhesives, such as fibrin glue. Mechanical fixation techniques are thought to contribute to postoperative complications, including pain, seroma or hematoma development, and osteitis pubis caused by tissue trauma. Additionally, these methods may increase the possibility of chronic pain by nerve entrapment [8–10]. Nonmechanical fixation techniques, by contrast, may mitigate these complications.

This study aimed to compare the outcomes for mesh fixation bytracking devices versus fibrin glue in patients undergoing TEP surgery for inguinal hernia. It was hypothesized that fibrin glue would provide superior outcomes compared to tackers, based on the aforementioned advantages.

MATERIAL AND METHODS

The research was a single-blinded, randomized study conducted in a tertiary care academic institution in India. The study involved 78 participants, divided equally into two groups. Inclusion criteria encompassed adult patients aged 18–60 years diagnosed with unilateral uncomplicated inguinal hernia, where the hernial sac was ≤5 cm. Randomization was performed using an opaque sealed envelope method immediately prior to mesh fixation during surgery. Group A patients underwent mesh fixation using tackers, while group B patients had mesh fixation with fibrin glue.

Patients with unilateral direct, indirect, or combined inguinal hernias were included, provided they met the age and sac size criteria. Exclusions applied to those unfit for general anesthesia, classified as ASA grade ≥3, or diagnosed with bilateral or other groin hernias. Complicated hernias (irreducible, obstructed, or incarcerated), recurrent hernias, and cases requiring conversion from TEP to open repair were also excluded.

Eligible patients underwent hematological and radiological evaluations, including preoperative ultrasound to measure hernial sac size. After obtaining informed consent, patients fasted overnight and received antibiotic prophylaxis (Ceftriaxone 1000 mg). Under general anesthesia, a 12-mm incision was done infraumbilically, and the preperitoneal space was dissected. Ports were placed, and a telescope was used to visualize the pubic tubercle. Subsequent steps included reducing the hernial sac, skeletonizing the cord, securing hemostasis, and inserting a 15 × 15 cm polypropylene mesh.

Patients in group A had the mesh fixed with 2–3 tackers to the Cooper's ligament and abdominal wall, while group B received mesh fixation using fibrin glue applied to the transversalis fascia. Skin incisions were stapled, and a compression dressing was applied for 48 hours. Mobilization began 12 hours post-surgery, and patients were discharged once they tolerated oral feeds, passed flatus and stool, regained mobility, and had manageable pain with oral medications.

Patients were followed up prospectively at intervals of 15 days, 1 month, 2 months, and 3 months. Postoperative clinical examinations were conducted to assess outcomes at each visit to monitor for complications. Data were coded and recorded in Microsoft Excel, with analyses performed using SPSS version 22.0. Quantitative variables were compared using the Student's t-test, while qualitative variables were analyzed with Fisher's exact test. A p-value of <0.05 was considered statistically significant.

RESULTS

A comparison of the clinicodemographic profile between the study groups (Group A and Group B) is shown in Table 1. The age distribution in both groups was similar. Most participants in both groups were aged between 40-49 years. Gender distribution was predominantly male in both groups, with no significant difference observed. Body mass index (BMI) distribution was also comparable between the two groups. The types of hernias observed in both groups were similar. Additionally, the size of the hernial sac did not significantly differ between the two groups, and the prevalence of comorbidities was similar across the groups.

Table 1: Comparison of clinicodemographic profile between the study groups

Characteristics	Group A (n=39)		Group B (n=39)		p-value
	n	%	n	%	
Age (years)					
20-29	5	12.82	4	10.26	0.203
30-39	7	17.95	13	33.33	
40-49	22	56.41	21	53.85	
50-60	5	12.82	1	2.56	
Gender					
Females	4	10.26	5	12.82	0.723

DOI: 10.69605/ijlbpr_13.12.2024.122

Males	35	89.74	34	87.18	
BMI (in kg/m²)					
20.1–25	16	41.03	16	41.03	0.741
25.1–30	13	33.33	13	33.33	
30.1–35	7	17.95	9	23.08	
>35	3	7.69	1	2.56	
Hernia type					
Indirect	23	58.97	22	56.41	0.302
Direct	12	30.77	16	41.03	
Both	4	10.26	1	2.56	
Hernial sac size (cm)					
2–3	22	56.41	17	43.59	0.159
3–4	14	35.9	13	33.33	
4–5	3	7.69	9	23.08	
Comorbidities					
No	27	69.23	26	66.67	0.808
Yes	12	30.77	13	33.33	

The outcome comparison between the study groups is presented in Table 2. The average hospital stay was significantly longer for Group A (54.26 ± 5.67 hours) compared to Group B (51.87 ± 4.39 hours), with a p-value of 0.04. The incidence of postoperative urinary retention was similar between the two groups. Hematoma formation within 15 days was reported in 10.26% of Group A and none in Group B, but this difference did not reach statistical significance. The incidence of seroma formation at 15 days was higher in Group A (20.51%) compared to Group B (7.69%), though this difference did not achieve statistical significance. At 30 days, seroma formation remained more common in Group A (33.33%) than in Group B (17.95%), but again, the difference was not significant. Regarding the return to normal activities, Group B demonstrated a quicker recovery at 15 days (76.92% returning to normal activities in Group B vs. 46.15% in Group A, p=0.083). At 30 days, Group B also had a higher rate of return to normal activities (79.49% vs. 66.67%, p=0.507), but the difference was not statistically significant. By 2 months, recovery was similar between the groups, with 79.49% in Group A and 97.44% in Group B returning to normal activities. At 3 months, almost all participants in Group B (100%) had returned to normal activities, compared to 92.31% in Group A, with no significant difference.

Table 2: Outcome comparison between the study groups

Characteristics	Group A (n=39)	Group B (n=39)	p-value
Mean operating time in minutes	84.89 ± 4.82	86.64 ± 5.92	0.156
Average hospital stay in hours	54.26 ± 5.67	51.87 ± 4.39	0.04
Incidence of postoperative urinary retention	7 (17.95)	5 (12.82)	0.563
Incidence of hematoma formation (15 days)	4 (10.26)	0 (0)	0.098
Incidence of seroma formation			
15 days	8 (20.51)	3 (7.69)	0.131
30 days	13 (33.33)	7 (17.95)	0.179
Return to normal activities			
15 days	18 (46.15)	30 (76.92)	0.083
30 days	26 (66.67)	31 (79.49)	0.507
2 months	31 (79.49)	38 (97.44)	0.399
3 months	36 (92.31)	39 (100)	0.729

DISCUSSION

In the current study, there was no statistically significant variance in operative time between the two groups, likely because both fixation methods were straightforward to perform. Preperitoneal mesh fixation required fewer tackers (approximately 2–3) compared to intraperitoneal mesh fixation. A meta-analysis conducted by Kaul et al. reported no significant difference in operating time when comparing staple fixation vs fibrin glue in TEP procedures [11]. Similarly, Shi et al. found no statistical dissimilarity in operative duration when comparing staple vs fibrin glue fixation in TAPP surgeries [10].

Hospital stay duration was notably shorter with the fibrin glue patients compared to the tacker group, likely due to faster patient mobilization and reduced pain in the fibrin glue group. Multiple studies comparing tackers and fibrin glue aimed at mesh fixation have demonstrated significantly reduced postoperative analgesic requirements in fibrin glue cases [8]. Furthermore, studies on open hernia repair

DOI: 10.69605/ijlbpr_13.12.2024.122

comparing sutures with fibrin glue fixation consistently reported reduced postoperative pain in fibrin glue cases [12].

Few cases of hematoma occurred in the tacker patients, while none were reported in fibrin glue cases. This difference, though not statistically significant, might be attributable to the increased trauma caused by tackers. Seroma formation rates were similar across both groups, consistent with findings from Kaul et al.'s meta-analysis [11]. Choi et al., in a propensity score-matched analysis, found no dissimilarities in postoperative complications such as hematoma, seroma, and urinary retention between the two groups [8]. However, some studies noted a higher frequency of urinary retention postoperatively in the tacker group, correlating with the number of tackers used [13,14].

Although mesh hernioplasty has substantially lowered hernia recurrence rates, chronic postoperative pain remains a major concern, often impairing quality of life. Nerve entrapment during mesh fixation is a preventable cause of this pain, though other mechanisms, such as meshoma formation incorporating nearby nerves, mesh contraction irritating nerve endings, and chronic inflammatory responses to the mesh, also contribute [15–17].

Patients in the fibrin glue group resumed daily activities significantly earlier than those in the tacker group, as supported by previous studies [8,18]. In vitro studies indicate that fibrin glue provides stronger mesh fixation compared to tackers [19]. While cyanoacrylate glue offers higher adhesive strength, fibrin glue is considered more physiological [20]. A noted drawback during surgery was the tendency of glue to adhere to instruments, necessitating thorough cleaning. This issue is more pronounced with cyanoacrylate glue than with fibrin glue. Though not analyzed in this study, fibrin glue is generally more cost-effective than tackers, making it a viable option in resource-limited settings and government hospitals.

The primary limitations of this study were the small sample size and the short follow-up period of three months, which is inadequate for assessing and comparing hernia recurrence rates between the groups. However, robust randomization and uniform surgical techniques, as all procedures were performed by the same team, were strengths of the study.

CONCLUSION

The use of fibrin glue for mesh fixation in TEP repair yields superior outcomes compared to tackers, particularly in terms of earlier resumption of daily activities. No significant differences were observed between the two methods regarding other postoperative complications. Therefore, fibrin glue is recommended as a preferred technique for mesh fixation in TEP, given its favorable outcomes and cost-effectiveness. Nevertheless, further validation through multicenter studies with larger sample sizes is necessary to confirm these findings.

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