

# Fibrin glue versus tacked fixation of mesh in laparoscopic transabdominal preperitoneal repair of inguinal hernia: A prospective study

Original  
Article

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## ABSTRACT

**Background:** Hernia repair is a frequently performed procedure within the field of general surgery. The common primary method is the trans-abdominal pre-peritoneal (TAPP) procedure which has the advantages of early recovery and minimal postoperative discomfort.

**Objectives:** The purpose of this study was to examine the effects of fibrin glue and stapler fixation on post-operative discomfort, cost, and early recurrence in TAPP inguinal hernia repair.

**Patients and Methods:** 33 patients with inguinal hernias who received TAPP inguinal hernia repair were included in this prospective, randomized comparative research. The patients were split into two groups: Group I: fibrin glue was used to fix the mesh in 15 patients. Group II: Tacker was used to fix the mesh in 18 patients. Every patient received follow-up care for a minimum of six to twelve months.

**Results:** There were no variations between the two groups' age, sex, or risk factors for the development of hernias. Patients presented preoperatively by recurrent hernias reported in 3 cases in group I and 7 cases in group II. In terms of operative time, there was no differences between the two groups. In both groups, there were no postoperative early recurrences or problems during the procedure. All patients were discharged on the first postoperative day, except for one case per group that was discharged on the second. There were five cases (33.3%) in the fibrin glue group and four cases (22.2%), in the tacker group suffered from post-operative scrotal edema. In both groups, two patients experienced a post-operative hematoma. In group I, there were 2 patients with minor hydrocele following surgery, whereas group II had 3 cases. The amount of post-operative groin discomfort and how long it lasted varied significantly between the two groups; the fibrin glue group experienced a shorter pain duration (*P value 0.037*). In the fibrin glue group, return to work occurred more quickly (*P value=0.028*), and everyday activities were resumed earlier. Compared to tacker (group II), fibrin glue consumable (group I) was less expensive per case.

**Conclusion:** In the short-term follow-up, fibrin glue, as opposed to tacker mesh fixation, had the benefit of reducing post-operative discomfort and allowing for an earlier return to work and everyday activities. As a safe and affordable substitute for disposable absorbatack, fibrin glue works well.

**Key Words:** Fibrin glue, Inguinal hernia, laparoscopic transabdominal preperitoneal repair, mesh fixation.

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## INTRODUCTION

The use of laparoscopic surgery to treat inguinal hernias has raised technological requirements. The primary technique, known as transabdominal pre-peritoneal (TAPP), has the advantages of early recovery and minimal discomfort following surgery. Mesh fixation generally classified into mechanical and non-mechanical procedures. Tissue penetration fixing procedures including staple guns and sutures are examples of mechanical approaches. Tissue adhesives and self-adhesive meshes are examples of non-mechanical methods<sup>[1]</sup>. Non-penetrating mesh fixation techniques are becoming increasingly popular<sup>[2]</sup>. Following laparoscopic hernia surgery, the chance of

recurrence is reduced with mesh fixation<sup>[3]</sup>. After hernia surgery, persistent discomfort can lower quality of life<sup>[4]</sup>. Another option for preventing persistent discomfort is to fix the mesh using fibrin glue<sup>[5]</sup>. Fibrin adhesives, which include hemostatic and adhesive qualities, are widely employed in many surgical procedures and are currently gaining traction as a mesh fixation substitute<sup>[6]</sup>.

### Objectives

The purpose of this study was to examine the effects of fibrin glue and stapler fixation on postoperative pain, usual return to activities, cost, and early recurrence in laparoscopic TAPP inguinal hernia repair.

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## PATIENTS AND METHODS:

Thirty-three patients with inguinal hernias, who were seen in the General Surgery Department of Tanta University Hospitals' Gastrointestinal and Laparoscopic Surgery Unit between July 2022 and July 2023, were included in this prospective, randomized comparison study.<sup>4</sup> The patients were split into two groups: Group I: fifteen patients had (TAPP inguinal hernia repair with fibrin glue mesh fixation. Group II: Eighteen patients had TAPP inguinal hernia surgery with tacker-assisted mesh fixation. A trocar measuring 10 mm is inserted via the first incision. Next, as shown in (Fig. 1), two more laparoscopic ports (5 mm) are carefully positioned based on the patient's abdominal shape, the surgeon's choice, ergonomics, and the presence of any adhesions. To see the myopectineal orifice, simultaneous blunt and sharp dissection was carried out in the preperitoneal avascular plane between the peritoneum and the Transversalis fascia. To reveal the vas deferens, the internal inguinal ring containing the spermatic arteries, and the inferior epigastric vessels. The 'Mercedes-Benz' mark is made up of these three components, which also regulate the direct or indirect inguinal sac.

A large piece of (Parietene produced by COVIDIEN macroporous polypropylene mesh 12 cm\*15 cm) was used to cover the myopectineal orifices and was spread out as much as possible against the abdominal wall, providing broad coverage of the indirect, direct, and femoral spaces.

In Group I, patients undergoing fibrin glue fixation, there were two vials one fibrin vial and one thrombin vial each of them (dry heat treated, freeze-dried, sterile) we put on each vial with 1 ml sterile water then we gently mix both vials for 1 min until complete dissolution then we loaded both solutions in syringes about 2 ml and then to double barrel applicator dedicated laparoscopic tool (Duplotip) then skin puncture 0.1 cm was done and the duplotip was introduced and visualized intraabdominal and applied to the cooper's ligaments and in proximity of the prevesical fat to assure good adhesion To obtain optimal binding between the mesh and the peritoneal wall as seen in (Fig. 2).

In Group II, we used covidien absorbback fixation device 5 mm that involved positioning of about 3–4 absorbable tacks at the level of Cooper's ligament and the pubic tubercle. Leaving the inferolateral portion of the mesh unstapled as seen in (Fig. 3).

Using continuous locking sutures (2-0 vicryl) absorbable sutures, the peritoneal flap was sealed. After being fully mobilized, having regular bowel movements, and excluding any early post-operative problems, patients were discharged from the hospital. During the first month postoperatively, all 33 patients came weekly for follow-ups. Subsequently, every patient in both groups received monthly follow-up care in the outpatient clinic for up to six months following surgery.

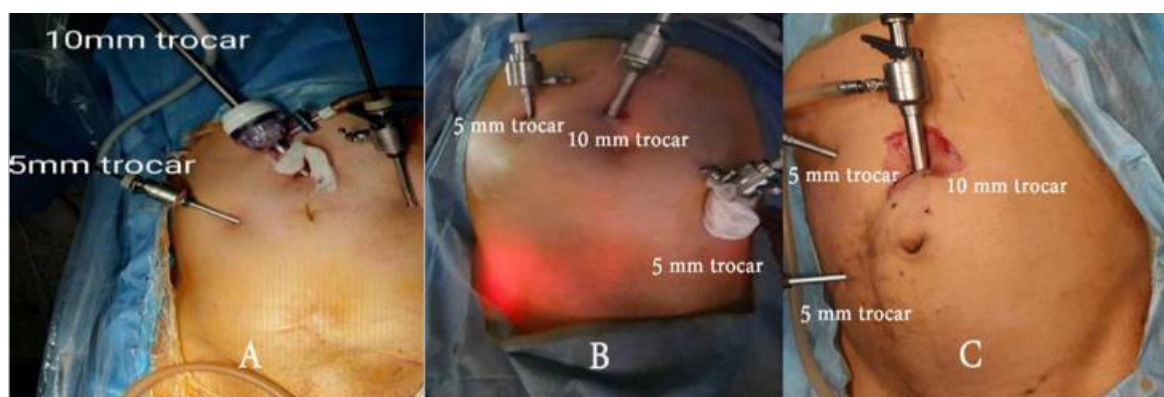


Fig. 1: Different manners of trocar placement.

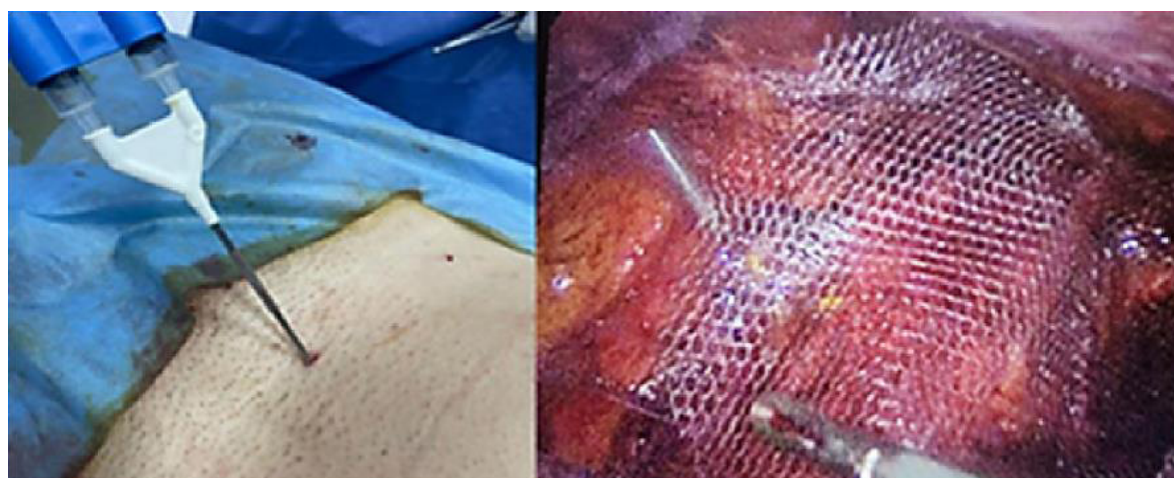


Fig. 2: Insertion of Duplotip and fibrin glue sprayed over mesh.

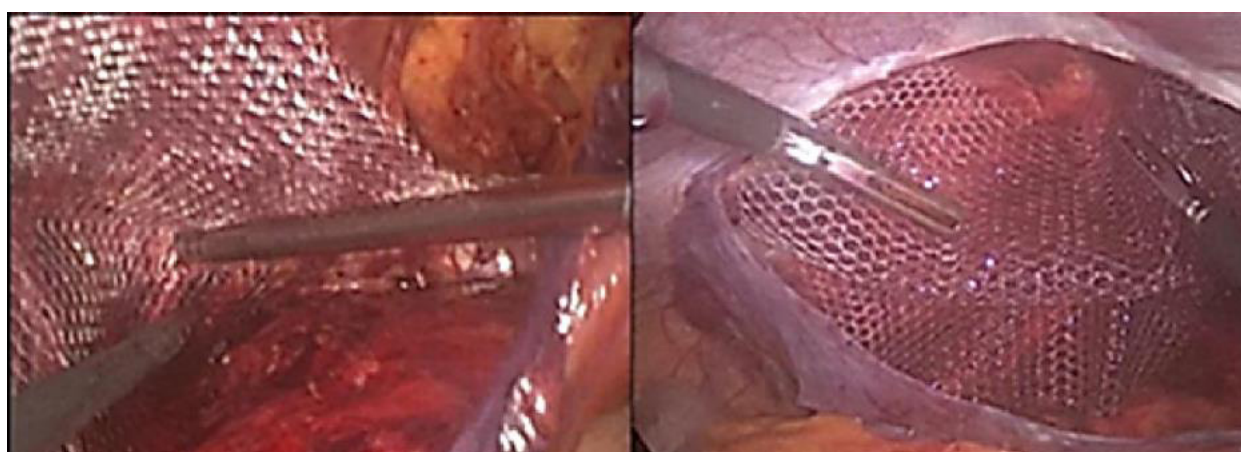


Fig. 3: Mesh unfolded and stapled in cooper's ligament.

**Statistical analysis of the data**

The computer was given data, and IBM SPSS software package version 20.0 was used for analysis. (IBM Corp., Armonk, NY) Numbers and percentages were used to describe the qualitative data. To confirm the distribution's normality, the Shapiro-Wilk test was performed. The terms range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR) were used to characterize quantitative data. At the 5% level, the results' significance was assessed. The tests that were employed were 1. Chi-square test: To compare groups based on categorical variables. 2. For chi-square, use Fisher's Exact or Monte Carlo adjustment when more than 20% of the cells have an anticipated count of fewer than 5. 3. Student t-test: To compare two groups under study for quantitative variables that are normally distributed. 4- Mann-Whitney test: For abnormally distributed quantitative variables, to compare between two studied groups.

**RESULTS:**

Two groups were matched with no differences in age, sex, and risk factors for hernia occurrence. Group I consisted of 11 males (73.3%) and 4 females (26.7%), Group II consisted of 16 (88.9%) males and 2 (11.1%) females. The patient characteristics of both study groups showed that the mean age of group I was 35.80 years compared to 44.33 years of group II. There were patients presented by recurrent inguinal hernia preoperatively and was reported in 3 cases (group I) and 7 cases in group II. There were no intraoperative complications (significant bleeding or laparoscopic failure) in both groups; also, there were and no post-operative early recurrence (failure) in both groups as well. According to operative time, no statistically significant difference was found in operative time between the two groups, group I had an operative time mean of 68±22.90 min compared to versus 71.11±21.93 min in group II. In bilateral cases presentations in both groups showed longer operative time with mean of (120+6.50 min). Postoperative complications occurred as seen in (Table 1).

Table 1: Comparison between the two studied groups according to early post-operative complications

	Fibrin glue (n=15) Number (%)	Tacker (n=18) Number (%)	$\chi^2$	P
Scrotal edema	5 (33.3)	4 (22.2)	0.509	<sup>FE</sup> p=0.475
Ileus	0 (0.0)	1 (5.6)	0.859	<sup>FE</sup> p=1.000
Seroma	0 (0.0)	1 (5.6)	0.859	<sup>FE</sup> p=1.000
Hematoma	2 (13.3)	2 (11.1)	0.038	<sup>FE</sup> p=1.000
Hydrocele	2 (13.3)	3 (16.7)	0.071	<sup>FE</sup> p=1.000
Surgical emphysema	0 (0.0)	0 (0.0)	–	–
Mesh infection	0 (0.0)	0 (0.0)	–	–
Recurrence	0 (0.0)	0 (0.0)	–	–



Based on hospital stays, 14 cases (93.3%) of the fibrin glue group and 17 cases (94.4%) of the tacker group were discharged on the first postoperative day, respectively, with no statistically differences. On the second day following surgery, one patient from each group was discharged. This was due to large scrotal edema in patient in group I and due to ileus in patient in group II.

As shown in (Fig. 4) and analyzed in (Table 2), there was a significant difference between the two groups with respect to the length of post-operative groin discomfort.

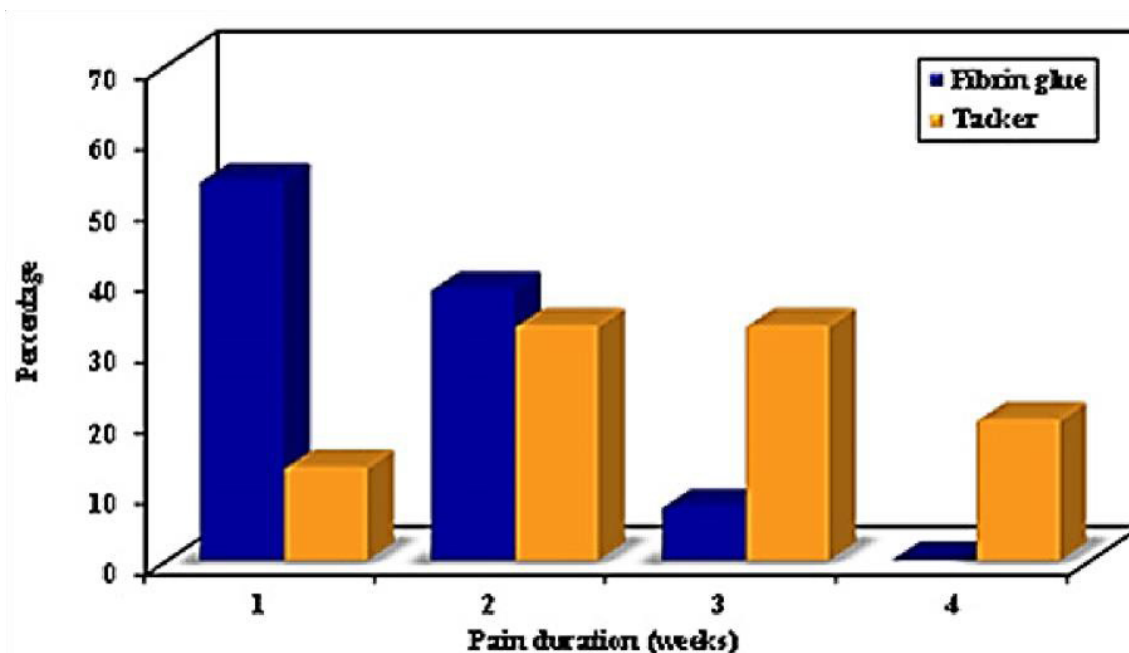
The fibrin glue group experienced reduced pain duration through the next weeks of operation with a *P* value of 0.037. To control postoperative pain, all patients required two non-steroidal analgesic injections on the first postoperative day. Following discharge, we prescribed three frequent oral doses of paracetamol per day until the patient was satisfied.

Return to work and daily activity was faster in group I with *P* value=0.028 and *P*-value=0.044 respectively with a significant difference, (Table 3).

**Table 2:** Comparison between the two studied groups according to pain analysis

	Fibrin glue (n=15) Number (%)	Tacker (n=18) Number (%)	Test of Sig.	<i>P</i>
<b>Post-operative groin pain</b>			$\chi^2=0.071$	FE <sub>p</sub> =1.000
■ No pain	2 (13.3)	3 (16.7)		
■ Yes	13 (86.7)	15 (83.3)		
<b>Pain duration (weeks)</b>			$\chi^2=7.670$	MC <sub>p</sub> =0.037*
■ 1	7 (53.8)	2 (13.3)		
■ 2	5 (38.5)	5 (33.3)		
■ 3	1 (7.7)	5 (33.3)		
■ 4	0 (00.0)	3 (20.0)		
<b>Pain analogue score in the first 24 h</b>			$\chi^2= 14.51 2$	MC <sub>p</sub> =0.004*
■ 0	2 (13.3)	3 (16.7)		
■ 1	8 (53.3)	1 (5.6)		
■ 2	4 (26.7)	6 (33.3)		
■ 3	1 (6.7)	0 (0.00)		
■ 4	0 (0.0)	2 (11.1)		
■ 5	0 (0.0)	6 (33.3)		

$\chi^2$ , Chi square test; FE, Fisher Exact; MC, Monte Carlo.  
P: *P* value for comparing between the two studied group.



**Fig. 4:** Comparison between the two studied groups according to pain duration (weeks).

**Table 3:** Comparison between the two studied groups according to duration for return to work and return to daily activities

	Fibrin glue (n=15) Number (%)	Tacker (n=18) Number (%)	$\chi^2$	P
Return to work(weeks)			8.489	FE <sub>p</sub> =0.028*
1	9 (60.0)	5 (27.8)		
2	5 (33.3)	3 (16.7)		
3	1 (6.7)	6 (33.3)		
4	0 (0.0)	4 (22.2)		
Return to daily activities (days)			5.109*	MC <sub>p</sub> =0.044*
1	1 (6.7)	0 (0.0)		
2	8 (53.3)	4 (22.2)		
3	6 (40.0)	14 (77.8)		

P: P value for comparing between the two studied groups.

\*Statistically significant at  $P \leq 0.05$ .

Inguinal hernia repair using fibrin glue as a consumable was much cheaper than using a tacker, (Table 4), as the fibrin glue average price was (2000) EGP while tacker

average price was (8000) EGP in the Egyptian market so the tacker price was about four times more expensive than fibrin glue price.

**Table 4:** Comparison between two groups regarding cost of disposable used in fixation

	Fibrin glue (n=15)		Tacker (n=18)		P
	Unilateral (n=13)	Bilateral (n=2)	Unilateral (n=15)	Bilateral (n=3)	
Cost for each case	2000	4000	8000	8000	P value=0.004*

P: P value for comparing between the two studied groups.

\*Statistically significant at  $P \leq 0.05$ .

## DISCUSSION

Laparoscopic TAPP for inguinal hernias repair offers several benefits, including also the cases presented with bilateral and recurrent hernias with less postoperative pain and discomfort, a shorter recovery period, and better cosmeses<sup>[7]</sup>. How to fix the mesh is one of the TAPP's contentious issues<sup>[8]</sup>. An experimental study done by Helmy and Hammam on 30 white mice, concluded that cyanoacrylate glue used as a method for closure of the abdominal wounds effectively and could be used for mesh fixation without complications<sup>[9]</sup>. Using the Transabdominal Preperitoneal (TAPP) technique, we compared the effectiveness of tacker with fibrin glue for mesh fixation in the treatment of inguinal hernias.

Males in their middle and older years are more likely to suffer from inguinal hernias, and the condition becomes more frequent as age advances. The research comprised both male and female patients, with a greater number and age distribution of men. In Group A, the mean±standard deviation (SD) for age was 35.80 (±12.20) years, while in Group B, it was 44.33 (±13.38) years. It is true that performing manual labor and hard lifting raises the risk of inguinal hernias<sup>[10]</sup>. Research on the connective tissue from inguinal hernia patients has suggested that smoking may be linked to

the development of hernias because of a malfunctioning metabolism of connective tissue. Whether smoking also increases the likelihood of recurrence<sup>[11]</sup>.

In our study, cases presented preoperatively with recurrent hernias were observed in (20%) of group I and (38.9%) of group II took longer time to operate on because of adhesion, which required more dissection. We found that although operative times varied between studies, there were no statistically significant differences, as observed in Zeinelden *et al.*<sup>[12]</sup>, Chandra *et al.*<sup>[13]</sup>, Hassan *et al.*<sup>[14]</sup>, Nizam *et al.*<sup>[11]</sup>, and Wasim *et al.*<sup>[15]</sup>. This is because operative time depend on a variety of factors, including the surgeon's surgical experience, the type of mesh, the ease of handling, and the method of mesh fixation and peritoneum closure. Ferrarese *et al.* discovered that there was no statistically significant difference in the mean operational time between the fibrin glue and tacker groups. This was mostly due to the precise preparation and application of the adhesive used<sup>[16]</sup>. Salah *et al.* discovered a difference in the mean operative time between the two groups. With a P-value of 0.009, the mean operating time for the fibrin glue group was greater than that of the tacker group (101±12.91 min)<sup>[10]</sup>. Helmy stated a significant decrease in the operative time for inguinal hernia repair using octyl cyanoacrylate (long chain) and n-butyl-2-cyanoacrylate (short chain), where 51.2%

(22/43) of cases were handled in less than 30 min. The use of the glue decreased the hospital stay and the use of post operative painkillers<sup>[17]</sup>.

Fixation techniques had an impact on postoperative pain, but it is not advisable to believe that this is the only variation that does so in the early phases of recovery. Our findings agreed with those of Zeinelden *et al.*<sup>[12]</sup>, who discovered statistically significant differences in postoperative pain between the two groups, and Andersson *et al.*<sup>[18]</sup>, who reported lower postoperative discomfort with fibrin glue fixation than with staples<sup>[18]</sup>. However, Salah *et al.* discovered that, with a *P*-value of 0.683, there were no differences in the two groups' pain levels 24 h following the procedure. The fact that each patient only received one dosage of nalbuphine might be the cause of this<sup>[10]</sup>. Our study found a significant difference in the length of pain between the fibrin glue group and the tacker group. The glue group experienced discomfort for a significantly shorter duration in weeks compared to the tacker group (*P*=0.037). These results were consistent with research conducted by Lovisetto *et al.*<sup>[19]</sup>.

Both groups spent mostly one day in the hospital and there were no variations in both groups. According to Cheah *et al.*, postoperative hospital stays were one day in group I, whose mesh was fixed with fibrin glue, and more than one day in group II, whose mesh was fixed with staples, in two patients<sup>[20]</sup>. On the other hand, Nizam and colleagues determined that the fibrin glue group had an average hospital stay of (49.34±0.60) hours, while the tacker group had an average hospital stay of (57.12±5.97) hours with a significant difference (*P*-value=0.001). This could be attributed to the early mobilization of patients and lower pain levels in the fibrin glue group<sup>[1]</sup>.

In two patients in each group, an ultrasonography examination revealed a postoperative hematoma, as described in report as a small hematoma related to neck of scrotum. Three of the four patients who had hematomas had recurrent hernias upon presentation, and extensive adhesions that required significant dissection and manipulation throughout the procedure. These patients were treated conservatively. In their investigation including thirty patients in each group, Nizam *et al.* also discovered that the incidence of hematoma development was 13.33% in the tacker group and 0% in the fibrin glue group. They provided an explanation for this by pointing out that the tackers generated more trauma than fibrin glue did with *P* value of 0.112 indicated that the results were not statistically significant<sup>[1]</sup>. Additionally, there was only one seroma case (6\*4 cm) in the tacker group related to the operative bed and inguinal canal as opposed to none in the fibrin glue group. The seroma was treated with ultrasound-guided aspiration and cured

after three weeks. According to Andhare *et al.*, at one week, the incidence of seroma development was 16% in the tackers group, 4% in the glue group, and 4% at one month. All seromas had disappeared after three months under conservative care, except for one patient that needed percutaneous aspiration. They found that, although there was no statistically significant difference, the incidence of seroma production was greater in the tacker group compared to the glue group. This might be because of the fibrin glue's adhesive properties and the peritoneal flap's strong resistance, which reduces dead space<sup>[21]</sup>. According to Shetiwy *et al.*, there were no statistically significant differences between the two groups' hematoma and seroma cases, and there were no cases of scrotal edema throughout the postoperative follow-up period<sup>[22]</sup>.

With a *P* value of 0.044, the fibrin glue fixation group in this study demonstrated a sooner return to activities than the tacker fixation group. It's possible that patients in the fibrin glue group had less discomfort than those in the tacker group. Unlike Salah *et al.*, who discovered no difference between the two groups<sup>[10]</sup>.

We ask patients who have undergone surgery to resume activities that do not involve physically demanding tasks after evaluating their post-operative return-to-work time. With a significant *P* value of 0.028, we can see that in Group I cases, early return to work was associated with better post-operative comfort compared to Group II cases. These findings are in line with those of Chandra *et al.*, who discovered that, after a 30-day follow-up, there was a significant difference between the two groups, favoring the fibrin glue group (*P* value=0.002). Their study had 100 patients<sup>[13]</sup>.

The most crucial factor to consider when addressing surgical hernia repair is recurrence. When discussing the causes of recurrence, displacement of the mesh from its location covering all hernia sites at the myopectineal orifice is thought to be the primary issue; however, in our study, there were no early recurrent cases over the three- and six-month follow-up periods. As opposed to Ferrarese *et al.*, who discovered that during follow-up two to four months following surgery, there were three recurring instances within the fibrin glue group but none within the tacker group. That was insignificant they stated that all recurrence appeared as indirect hernias and occurred in the glue Group due to Incorrect dilution of glue and not the right size of the mesh was the cause of recurrence<sup>[16]</sup>.

In our study, there was no statistically significant variation in post-operative chronic pain after three to six months. We clarify that during mesh attachment, we employed absorbable tacks that dissolved in three to six months. Wang *et al.* found no chronic pain in non-fixation and cyanoacrylate instances, 2.2% in

staple fixation cases, and 2.1% in cyanoacrylate plus staples cases. These results were in line with their findings<sup>[23]</sup>. Unlike Shetiwy *et al.*, who employed non-absorbable tacker and Cyanoacrylate glue, their study found a statistically significant difference between the studied groups regarding chronic pain, with one case in group I (tissue adhesives) and six cases in group II (tacker group). They defined chronic pain as when a patient scores more than 1 on any item of the CCS (Carolina Comfort Scale) indicating that the pain is bothering them<sup>[22]</sup>.

This research has concentrated on surgical consumables costs, considering the range of treatments that surgeons could choose from. The technologies utilized during surgery had an impact on both the result and possible follow-up expenses. In the current study, there was no significant difference between the two groups' hospitalization time costs, and the operative time, which was identical, meaning there was no difference in surgical time cost between the two techniques. In the bilateral cases, we used two packages of fibrin glue and the same tacker in the tacker group; the price of the tacker was approximately four to five times more than that of the fibrin glue, but the fibrin glue was still less expensive and more cost-effective. There was a statistically significant difference between the two groups on the consumable materials only ( $P$  value=0.004). These findings were agreed with those of Hassan *et al.*<sup>[14]</sup> and Salah *et al.*<sup>[10]</sup>, who reported that there was a statistically significant cost difference between the two groups, with group B (tacker) paying more than group A (fibrin glue). Argesta *et al.*, demonstrated that employing fibrin glue has a clear advantage as well, as it costs 190 euros as opposed to 360 euros for absorbable tacks<sup>[24]</sup>. Panda *et al.* found that there is a direct cost reduction of £249 per case when using Fibrin Sealant for fixing instead of Tacker fixing. Additionally, this group has better clinical and financial outcomes in terms of seroma, neuralgia, and time to return to work, among other metrics<sup>[25]</sup>.

## CONCLUSION

Laparoscopic TAPP is a safe and feasible technique with better results with the choice of macroporous proline light weighted mesh in decreasing pain and seromas postoperatively. Both techniques of mesh fixations showed nearly equal operative timing with better results in fibrin glue fixation in lowering the post-operative pain, earlier returning to work and daily activities and available extremely low-cost consumables compared to tacker mesh fixation. It could be used as an efficient alternative to disposable absorbatack. Also, the use of absorbable tacks is a tricky point to avoid long-term chronic groin pain.

## CONFLICT OF INTEREST

There were no conflicts of interest.

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