

## Mesh Fixation by Fibrin Glue versus Tackers in Laparoscopic Transabdominal Preperitoneal (TAPP) Repair of Inguinal Hernia

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### ABSTRACT

**Background:** As laparoscopic repair of groin hernia is gaining popularity; most surgeons argue over which mesh fixation techniques are the best. **Objective:** The present study was conducted to compare the outcomes of mesh fixation using fibrin glue versus tackers in laparoscopic transabdominal preperitoneal (TAPP) repair of inguinal hernia, with the ultimate goal of bettering the health and happiness of inguinal hernia patients.

**Subjects and Methods:** This study included a total of 24 inguinal hernia patients chosen for laparoscopic transabdominal preperitoneal repair with mesh fixation by fibrin glue versus tackers, attending at General Surgery Department, Zagazig University Hospitals. Patients were randomly divided into 2 equally groups: Group (A) A fibrin glue was used to fix the mesh and Group (B) Using tackers, to fixed the mesh.

**Results:** There was a statistically significant difference between the groups investigated in terms of operative time, with the fibrin glue group taking significantly longer than the tackers group. Within-day pain and length of hospital stay did not differ significantly between the groups. While return to daily activity was faster in fibrin glue groups. The cost of all cases of fibrin glue group was lower than that of tackers group.

**Conclusion:** It could be concluded that mesh fixation by fibrin glue is better than tacker as mesh fixation with glue causes less post-operative pain and less analgesia is needed as well as low financial cost.

**Keywords:** Mesh Fixation, Fibrin Glue, Tackers, Inguinal Hernia.

### INTRODUCTION

As a result of the anatomical predisposition of men for the development of inguinal hernias, men account for nearly all cases of this prevalent surgical ailment. An inguinal hernia can become life-threatening if the bowel inside the peritoneal sac is suffocated, gets clogged, or both. Among the many types of general surgical procedures, inguinal hernia repair is extremely common <sup>(1)</sup>. Tension-free repair with the use of a mesh prosthesis has been shown to have the lowest recurrence rate in the history of inguinal hernia surgery, dropping from about 20% to 1% <sup>(2)</sup>. Laparoscopic inguinal hernia repair has risen in popularity during the past two decades <sup>(3)</sup>.

Inguinal hernias can now be treated with laparoscopic hernia repair because to advancements in the field. The most common type of laparoscopic hernia repair is the transabdominal preperitoneal (TAPP) approach. It has been claimed that TAPP repair decreases the likelihood of experiencing postoperative discomfort, shortens the duration of the hospital stay, and speeds up the recovery process. As laparoscopic inguinal hernia repair utilizing tension-free mesh becomes more common, its benefits are increasingly being weighed against its more invasive counterpart. The success of this surgical treatment hinges on two factors: choosing a mesh of the right size and fixing it properly to the surrounding tissues <sup>(4)</sup>. Using tissue piercing procedures (tacks), either titanium or absorbable tackers, to fix mesh prostheses guarantees mesh stability and absorption into surrounding tissues; nonetheless, difficulties of these treatments were not rare, since numerous studies documented a variety of complications <sup>(1)</sup>.

Injuries to the inferior epigastric arteries, femoral nerve, genito-femoral nerve, and lateral cutaneous nerve

of the thigh were the most frequently reported consequences. Due to adhesion between the viscera and the utilized tacks, certain studies have observed colonic and small intestinal fistula, which can cause severe pain and may require surgical intervention <sup>(5)</sup>.

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Fibrin glue and N-butyl-2 cyanoacrylate are the two most popular glues for fixing mesh. Biodegradable "fibrin glue" is made by mixing fibrinogen and thrombin from human sources. Fibrinogen not only acts as a blood clot but also provides the product with tensile strength and adhesive qualities. Newer cyanoacrylates, such N-butyl-2-cyanoacrylate, have been put to use as surgical tissue adhesives since the 1960s <sup>(7)</sup>.

There was some slight inflammation at the site of application in the experimental tests involving cyanoacrylate glue. However, no direct clinical relevance to this discovery has been established <sup>(8)</sup>.

Decisions about the type of fixation device utilized are heavily influenced by the preferences of individual surgeons <sup>(9)</sup>. In an effort to prevent chronic pain from a fixation device, many surgeons opt to not fixate the mesh <sup>(10)</sup>.

Our aim was using TAPP repair for an inguinal hernia and compare fibrin glue and tackers for mesh fixation with the ultimate goal of bettering the health and happiness of inguinal hernia patients.

## SUBJECTS AND METHODS

This study included a total of 24 inguinal hernia patients chosen for laparoscopic transabdominal preperitoneal repair with mesh fixation by fibrin glue versus tackers, attending at General Surgery Department, Zagazig University Hospitals.

### *Ethical Consideration:*

This study was ethically approved by Zagazig University's Research Ethics council. Written informed consent of all the participants was obtained. The study protocol conformed to the Helsinki Declaration, the ethical norm of the World Medical Association for human testing.

The included 24 subjects were divided into two groups; **Group A** consisted of 12 patients, who underwent mesh fixation by fibrin glue and **Group B** consisted of 12 patients, who underwent mesh fixation using tackers to fix the mesh.

**Inclusion criteria:** Patients accepted to participate in this study. Patients aged above 18 years, and male patients.

**Exclusion criteria:** Patients with medical conditions that prevented them from receiving general anesthesia. History of abdominal or pelvic surgery. Unfit for laparoscopic surgery. (Obstructive air way disease, cardiac and prior major vascular surgery). Those with ascites and abdominal malignancy. Patient refused mesh placement, and immunosuppressant drug use, as well as the presence of an illness that compromises immunity or causes persistent inflammation,

### **All patients were subjected to:**

- A. History taking:** Full clinical history taking with special emphasis on the presenting symptoms.
- B. Clinical Examination:** Both general and local.
- C. Laboratory investigations:** Liver function tests, kidney function tests, CBC, coagulation profile, Glycemic profile.
- D. Imaging studies:** Pelviabdominal ultrasound, chest X-Ray and CT abdomen and pelvis if needed.

### **Operative technique:**

Twenty-four patients were subjected to inguinal hernioplasty using laparoscopic trans-abdominal preperitoneal repair.

### **Step 1: Placement of trocars:**

The camera trocar was inserted using open technique above the umbilicus, and two further 5 mm trocars are inserted on either side of the rectus sheath at the same level as the umbilicus. CO<sub>2</sub> is inflated into the abdomen at a pressure of (12-14 mmHg). When using a telescope, a field of vision of 30 degrees was optimal.

### **Step 2: Identification of anatomic landmarks:**

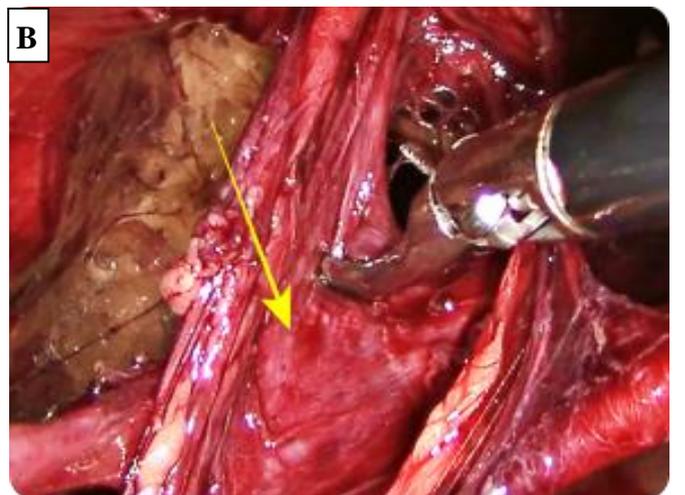
First, an exploratory laparoscopy was performed to locate the inguinal region and all of the relevant anatomical features, such as the epigastric arteries, the umbilical ligament, the triangle of death, and the triangle of pain.

### **Step 3: Peritoneal flap dissection:**

Beginning at a position near the anterior superior iliac spine and continuing medially up to the midline, a peritoneal flap was dissected to create the space.

### **Step 4: Dissection around the hernia sac:**

The sac was dissected free from the spinal column and other structures, and the dissection was continued medially to the bladder's lateral wall so that mesh could be inserted. The sac was withdrawn inwardly through the opening.



**Figure (1): Dissection around the hernia sac (Yellow arrow) hernia sac.**

### **Step 5: mesh fixation:**

Polypropylene mesh measuring 15 by 15 centimeters was rolled into a tube and inserted through a 10 millimetre (mm) umbilical trocar. The femoral ring area, the indirect space, and the direct space are all covered by the mesh.



**Figure (2): (a); Mesh insertion (b); Mesh in place.**  
To prevent hemorrhage tackers used in fixation (group A) among the anterior abdominal wall and the cooper's ligament bilaterally, along the inferior epigastric arteries.



**Figure (3): Fixation of the mesh by the tackers (arrows).**

**Step 6: Closure of the peritoneum:**

We use 2/0 Vicryl sutures (Continuous sutures) to close the peritoneal flap either in or with tackers.

**Step 7: Removal of ports and closure of the skin.**

**Postoperative management and follow up:**

Antibiotics coverage by cefotaxime twice; one dose on induction of anesthesia and another dose after 12 hours. Pethidine hydrochloride 50 mg was administered intramuscularly to all patients once during the immediate postoperative period. After that, non-steroidal anti-inflammatory medicines (Diclofenac sodium 50mg) were given orally to the patient before they were sent home to help with the pain. After surgical procedures, patients were released with a week of outpatient clinic follow-up.

**Statistical analysis**

In order to analyze the data acquired, Statistical Package of Social Services version 20 was used to execute it on a computer (SPSS). In order to convey the findings, tables and graphs were employed. The quantitative data was presented in the form of the mean, median, standard deviation, and confidence intervals. The information was presented using qualitative statistics such as frequency and percentage. The student's t test (T) was used to assess the data while dealing with quantitative independent variables. Pearson Chi-Square and Chi-Square for Linear Trend (X<sup>2</sup>) were used to assess qualitatively independent data. The significance of a P value of 0.05 or less was determined.

**RESULTS**

To ensure that the groups were evenly matched, we looked for statistically significant differences in age (years) and occupation (p>0.05). Sex-wise, both sets of cases were male.

**Table (1): The distribution of patients according to demographic data:**

Variable	Group A (n=12)	Group B (n=12)	Tests				
			t	P value			
Age (years) Mean± SD	29.92± 7.48	38.0± 11.86	-1.997	0.06 (NS)			
Variable	No	(%)	No	(%)	x <sup>2</sup>	P value	
Gender	male	12	100	12	100	-----	-----

Groups were matched since there were no significant differences in hernia location between the groups tested (p>0.05).

**Table (2): Distribution of patients according to site of hernia:**

Variable		Group A (n=12)		Group B (n=12)		Tests	
		No	(%)	No	(%)	x <sup>2</sup>	P value
site of hernia	indirect (BL)	2	16.7	1	8.3	0.381	0.537 (NS)
	indirect (UL)	10	83.3	11	91.7		

When it came to operative time spent making sure the groups were evenly distributed, the fibrin glue group had a significantly longer mean duration ( $p < 0.05$ ).

**Table (3): Operative time of the two studied groups:**

Variable	Group A (n=12)		Group B (n=12)		Tests	
	No	(%)	No	(%)	t	P-value
Operative time (min)	116.42±		101.0±		2.857	0.009*
Mean± SD	13.52		12.91			

As shown in table (4), significant variations in intraoperative complication rates were seen across the groups.

**Table (4): Difference between the two groups regarding intra operative complication:**

intra Operative complication	Group A (n=12)		Group B (n=12)		P-value
	No	(%)	No	(%)	
yes	0		0		0.009*
no	12	100%	12	100%	

Pain scores were similar across groups after 24 hours of matching ( $p > 0.05$ ). All patients were given NSAIDs to alleviate their pain. In every case, the pain stopped within 7 days of surgery.

**Table (5): Pain characteristics of the two studied groups:**

Variable		Group A (n=12)		Group B (n=12)		Tests	
		No	(%)	No	(%)	x <sup>2</sup>	P value
		Pain (in 1 <sup>st</sup> 24 hours)	Mild	8	66.7		
Moderate	3		25	4	33.3		
Severe	1		8.3	2	16.7		
Pain scale (7 days)	No pain	12	100	12	100		
Pain medication	NSAID	12	100	12	100		

Scrotal edoema was measured and shown to have no statistically significant differences between the groups, allowing for proper group matching ( $p > 0.05$ ).

**Table (6): Scrotal swelling in the two studied groups:**

Variable		Group A (n=12)		Group B (n=12)		Tests	
		No	(%)	No	(%)	x <sup>2</sup>	P value
Scrotal swelling	No	11	91.7	10	83.3	0.381	0.537 (NS)
	Yes	1	8.3	2	16.7		

As shown in table (7), all cases stayed for one day at hospital after operation. Half of cases of tackers group

return to daily activity within (2- 3 days) and the other half returned within (4-6) days while more than half of cases of fibrin glue group return to daily activity within (2- 3 days) and other (33.3%) of cases returned within (4-6) days. All cases return to work within (12-16 days).

**Table (7): hospital stay and return to daily activity and work of the two studied groups:**

Variable		Group A (n=12)		Group B (n=12)	
		No	(%)	No	(%)
Hospital stay (day)	1 day	12	100	12	100
Return to daily activity	Within (2- 3 days)	8	66.7	6	50
	Within (4-6 days)	4	33.3	6	50
Return to work (days)	Within (12-16 days)	12	100	12	100

As shown in table (8), all cases didn't show recurrence during 6 months.

**Table (8): Recurrence of hernia during 6 months of the two studied groups:**

Variable		Group A (n=12)		Group B (n=12)	
		No	(%)	No	(%)
Recurrence after 3 months	No	12	100	12	100

As shown in table (9), the cost of all cases of fibrin glue group was low while the cost of tackers group was high cost.

**Table (9): Cost of operation of the two studied groups:**

Variable		Group A (n=12)		Group B (n=12)	
		No	(%)	No	(%)
Cost	low cost	12	100	0	0
	high cost	0	0	12	100

## DISCUSSION

About a third of all surgical interventions are for inguinal hernias, making it one of the most prevalent surgical operations. There was a marked reduction in early postoperative pain with laparoscopic inguinal hernial surgery compared to open mesh repair, allowing for quicker movement and a quicker return to work. That was evident in the workers who had laparoscopic procedures done <sup>(11)</sup>.

One of the controversies in TAPP is how to fix the mesh. Mesh can be fixed either by fibrin glue, tacker

clips, suturing and self-adhesive mesh or leaving mesh without fixation<sup>(12)</sup>.

In this study, all patients were male, ages varying between (20-60) with average of 40 years old. The Mean± SD in group A was 29.92±7.48 years and in group B was 38.0±11.86 years with P value (0.06) which non-significant (NS). This data was similar to data of **Wasim et al.**<sup>(13)</sup> in which minimal age was 20 years and maximal age was 67 years with mean age of 52.2±13.88 in fibrin glue group and 50.53±18.07 years in tackers group.

Concerning the majority of patients were manual worker (heavy work) 58.3% followed by office clerk and students (light work) 41.7%. This is an indicator that manual work and heavy lifting is indeed a factor that increases the risk of developing inguinal hernia. These Percentages were comparable to those of the study published by **Eisa et al.**<sup>(14)</sup>.

Regarding the type of hernia presented in this study, both groups' patients had indirect inguinal hernia. Group A had 2 patients (16.7 %) with bilateral inguinal hernia and 10 patients (83.3%) with unilateral inguinal hernia. Group B one patient (8.3%) had bilateral inguinal hernia and 11 patients (91.7%) with unilateral inguinal hernia Groups were matched since there were no significant differences in hernia location between the groups tested. (p>0.05). this data was nearly similar to data of **Wasim et al.**<sup>(13)</sup> in which almost the patients were had indirect inguinal hernia. These results were non compatible with **Hassan et al.**<sup>(15)</sup> who reported that regarding to type of hernia, there were 4 (20%) patients presented with direct hernia and 16 (80%) patients presented with indirect hernia in both groups. No statistically significant changes in hernia location were found across groups, and this allowed for accurate group matching. (p=1.00).

As regard operative time, it was distributed as Mean± SD 116.42±13.52 (min) in group A and Mean± SD 101.0±12.91(min) in group B with P value 0. 0009. There were statistically significant differences between the studied groups regarding operative time ensuring matching of the groups (p<0.05) where the higher mean duration was within group A (116 minute) and lower in group B (101 minute). **Hassan et al.**<sup>(15)</sup> reported that operative time was comparable between both groups. The mean operating time was 46.8±5.3 in fibrin glue group and for tacker group was 47±4.4. There were statistically insignificant differences between the studied groups regarding operative time (P=0.68).

In this study the difference between the two groups regarding intraoperative complications was statistically insignificant. It was no intra operative complications in both groups. Which similar to results of **Gelebeševa Mateska et al.**<sup>(16)</sup>. On the other hand **Hassan et al.**<sup>(15)</sup> illustrated that considering intraoperative complication, there was one case in tacker group had intraoperative surgical emphysema and oozing of blood during dissection. There was no significance among groups considering to intraoperative complication.

In the current study we found that within 24 hours of starting the study, there were no statistically significant variations in pain levels across the groups. (p>0.05). All cases received one does of Nalbuphine (20 mg) in 1<sup>st</sup> 24hours postoperative and thereafter treated with NSAIDs (Diclofenac Sodium) the analgesic doses required were guided by the severity of postoperative pain measured by the Visual Analogue Scale (VAS). All cases showed no chronic pain post-operatively during follow up period. Matching our results, **Ferrarese et al.**<sup>(17)</sup> reported that no significant difference was observed about chronic pain.

In the current study, we discovered that scrotal swelling (seroma) did not differ significantly across the groups tested. (p>0.05). There were 2 cases 16.7% in group B and one case 8.3% in group A. This result agrees with result of **Wasim et al.**<sup>(13)</sup> which was scrotal swelling in two cases one of them in form of seroma (6.6%) and another in form of hematoma (6.6%). On other hand **Mohammad et al.**<sup>(6)</sup> showed that Hematoma and seroma had no statistically significant differences in both groups; we reported zero cases of scrotal swelling in both groups during the postoperative follow-up time.

Our current findings clearly revealed that all cases stayed for one day at hospital after operation. Half of cases of group B return to daily activity within (2- 3 days) and the other half returned within (4-6) days while more than half of cases of group A return to daily activity within (2- 3 days) and other (33.3%) of cases returned within (4-6) days. All cases return to work within (12-16 days). Which was better than the results of **Hassan et al.**<sup>(15)</sup> which there was no significance among two groups. However, in tacker group three cases stayed more than one day as they were complaining of pain and scrotal edema.

In this study the difference between the two groups regarding postoperative recurrence was statistically insignificant, as no recurrent cases in two groups (0%) during follow up period (3-6months), this is agreeing with the result of **Hassan et al.**<sup>(15)</sup> in which there was no significance among groups considering postoperative recurrence. There was only one patient showed a recurrence in tacker group. This recurrence may be due to mesh migration or may be due to not fixing the mesh. On the other hand, the result of **Tolver et al.**<sup>(18)</sup> who reported that there was With regard to reoperation for recurrence, two patients in the fibrin group and none in the tacks group had surgery within the first six months. (p = 0.241).

There was statistically significant difference between two groups regarding the costs, the cost was higher in group B than group A this results matching with the results of others as **Eisa et al.**<sup>(14)</sup> and **Hassan et al.**<sup>(15)</sup>. However, mesh fixation by fibrin glue has lower cost than tackers.

## CONCLUSION

It could be concluded that mesh fixation by fibrin glue is better than tacker as mesh fixation with glue

causes less post-operative pain and less analgesia is needed as well as low financial cost.

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**Author contribution:** Authors contributed equally in the study.

## REFERENCES

1. **Gupta A, Mazari F, Samuel N *et al.* (2017):** Mesh fixation techniques for laparoscopic inguinal hernia repair in adults. *Cochrane Database Syst Rev.*, 2017(10): 153-16.
2. **Cavazolla L, Rosen M (2013):** Laparoscopic versus open inguinal hernia repair. *Surg Clin N Am.*, 93:1269–1279.
3. **Abd El-Halim M, El-Nemr S, Hedaya M *et al.* (2020):** Comparison between mesh fixation using tacks and non-mesh fixation during total extra peritoneal (TEP) laparoscopic inguinal hernia repair. *Al-Azhar Med J.*, 49(3): 1349-1358.
4. **Lyu Y, Cheng Y, Wang B *et al.* (2020):** Comparison of endoscopic surgery and Lichtenstein repair for treatment of inguinal hernias: A network meta-analysis. *Medicine*, 99(6): 119-134.
5. **Olimi S, Uccelli M, Cesana G *et al.* (2020):** Laparoscopic abdominal wall hernia repair. *Journal of the Society of Laparoscopic & Robotic Surgeons*, 24(1):234-251.
6. **Mohammad H, Fiad A, Nour H *et al.* (2020):** Short term outcome of laparoscopic trans-abdominal preperitoneal (TAPP) inguinal hernia repair without mesh fixation, a comparative study. *The Egyptian Journal of Hospital Medicine*, 81 (3): 1644-1647.
7. **Murphy J (2017):** Inguinal Hernia Repair Now and in the Future. In: Giampiero Campanelli (Editor): *Inguinal Hernia Surgery*. Springer. Milano. Pp. 37-42. <https://link.springer.com/book/10.1007/978-88-470-3947-6>
8. **Lovisetto F, Zonta S, Rota E *et al.* (2007):** Use of human fibrin glue (Tissucol) versus staples for mesh fixation in laparoscopic transabdominal preperitoneal hernioplasty: a prospective, randomized study. *Ann Surg.*, 245(2):222–231.
9. **Kaul A, Hutfless S, Le H *et al.* (2012):** Staple versus fibrin glue fixation in laparoscopic total extra peritoneal repair of inguinal hernia: a systematic review and meta-analysis. *Surgical Endoscopy*, 26(5): 1269-1278.
10. **Lo C, Tsai Y, Yang S *et al.* (2019):** Comparison of short- to mid-term efficacy of no fixation and permanent tack fixation in laparoscopic total extra peritoneal hernia repair: A systematic review and meta-analysis. *Tzu-chi Medical Journal*, 31(4): 244–253.
11. **ZeinElden A, Moustafa F, Nassar S *et al.* (2018):** Use of human fibrin glue versus staples for mesh fixation in laparoscopic transabdominal preperitoneal hernioplasty of inguinal hernia. *Menoufia Medical Journal*, 31(1): 140-45.
12. **Habeeb A, Mokhtar M, Sieda B *et al.* (2020):** Changing the innate consensus about mesh fixation in trans-abdominal preperitoneal laparoscopic inguinal hernioplasty in adults: short- and long-term outcome. Randomized controlled clinical trial. *International Journal of Surgery*, 83(1): 117-124.
13. **Wasim R, Mela A, Hanief R *et al.* (2015):** Comparative study of fibrin sealent versus use of tackers in inguinal hernia repair. *Cukurova Medical Journal*, 40(3): 457-465.
14. **Eisa A, Gaber A, Harb T (2014):** Laparoscopic transabdominal preperitoneal inguinal hernia repair. *Egyptian Journal of Surgery*, 33(2):86- 89.
15. **Hassan M, Abo El-Yazeed M, Ali Salem A (2022):** Fibrin Glue versus Staple for Mesh Fixation in Laparoscopic Transabdominal Preperitoneal Repair of Inguinal Hernia. *Al-Azhar International Medical Journal*, 3(4): 133-137.
16. **Gelebeševa Mateska T, Omejc M, Kunst G *et al.* (2018):** A comparison study of the efficacy of tacker mesh fixation, glue mesh fixation and no mesh fixation in transabdominal preperitoneal inguinal hernia repair. *Collegium Antropologicum*, 42 (4): 271-276.
17. **Ferrarese A, Marola S, Surace A *et al.* (2014):** Fibrin glue versus stapler fixation in laparoscopic transabdominal inguinal hernia repair: a single center 5-year experience and analysis of the results in the elderly. *International Journal of Surgery*, 12 (2): 94-98.
18. **Tolver A, Rosenberg J, Juul P *et al.* (2013):** Randomized clinical trial of fibrin glue versus tacked fixation in laparoscopic groin hernia repair. *Surgical Endoscopy*, 27(8): 2727-2733.