ORIGINAL ARTICLE

Glue Versus Tacker Fixation of Mesh in Trans Abdominal Preperitoneal Laparoscopic Inguinal Hernial Repair

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Abstract

Background: ***Repair of inguinal hernia is one of the most commonly conducted procedures in the field of general surgery.***

Aim: ***To assess uses of cyanoacrylate-based glue versus tacker for mesh fixation in laparoscopic trans abdominal preperitoneal (TAPP) inguinal hernia repair and assessment of postoperative pain, operative time, hospitalization, morbidity, cost, return to work, and recurrence rate.***

Patients and methods: ***This was a prospective randomized investigation performed on forty adult patients in the outpatient clinics of Al-Azhar University hospitals from August 2023 to August 2024,***

Results: ***Ninety percent of cases in group A and sixty percent in Group B experienced pain relief within 7 days of surgery, while pain was scored one in two cases in group A and two in five cases in group B. Pain stopped in all cases within fourteen days. Postoperative complications, such as scrotal swelling, did not differ significantly among groups. Hospital stay analysis demonstrated that ninety-five percent of cases in the cyanoacrylate-based Group and eighty-five percent in the tacker group were discharged on the first postoperative day, with no significant difference. Recurrence was found in one case in the tacker group,***

Conclusion: ***This study revealed that laparoscopic transabdominal preperitoneal repair for inguinal hernias is effective because it is a safe surgical technique that permits quick recovery and return to regular activities. Mesh fixation utilizing Cyanoacrylate-based glue is preferable to tackers due to its ability to generate less post-surgical pain and require less analgesia.***

Keywords: Cyanoacrylate basis glue; Tacker Fixation; Abdominal Preperitoneal Laparoscopic; Inguinal Hernial Repair

1. Introduction

Inguinal hernia repair is one of the most prevalent conducted procedures in the field of general surgery, this can be explained as inguinal hernia is the most prevalent hernia.[1]

Minimally invasive methods for the repair of inguinal hernia using laparoscopy/endoscopic methods were developed. In these procedures, the inguinal hernia is established posteriorly in contrast to the open anterior approach. It is still a matter of debate which of these approaches is the best.[2]

Different techniques for mesh application via posterior approach, like the total extraperitoneal repair (TEP) and the transabdominal preperitoneal repair (TAPP), were associated with the highest acceptance. Laparoscopy is characterized by decreased hospitalization duration and less morbidity.[3]

Postoperative pain following any procedure is a multifactorial process that is affected by factors related to the patient, like age and tolerance to pain, and other factors, such as the intervention type and whether it is associated with complications or not. The method of mesh fixation during mesh hernia repair is strongly related to postoperative pain.[4]

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Cyanoacrylate-based glue is a synthetic cyanoacrylate that contains an Iso-Amyl chain. Cyanoacrylate-based glue is inactive without water, but in the presence of water, particularly when loaded with hydroxide ions, it polymerizes exothermically. The process of polymerization results in adherence of targeted surfaces within five to six seconds and reaching the final stage in sixty seconds. It has a bacteriostatic effect. After variable periods, hydrolytic breakdown occurs, and this results in the elimination of the cyanoacrylate-based glue. Breakdown period varies depending on the quantity of Cyanoacrylate-based glue applied and tissue type.[5]

This investigation was intended to assess the utilization of Cyanoacrylate-based glue versus tacker for mesh fixation in laparoscopic trans abdominal preperitoneal (TAPP) inguinal hernia repair and assessment of postoperative pain, operative time, hospitalization, cost, morbidity, recurrence rate, and work.

2. Patients and methods

This was a prospective randomized investigation involving forty adult cases in the outpatient clinics of Al-Azhar University hospitals from August 2023 to August 2024. Cases have been classified into two equal groups. All cases underwent the (TAPP) approach. Group A (n: 20 cases) had mesh fixation by Cyanoacrylate-based glue, and Group B (n: 20 cases) had mesh fixation by tacker.

Inclusion criteria: Cases with inguinal hernia among individuals aged 15 to seventy years old, gender: Male & Female, cases undergoing laparoscopic inguinal hernia mesh repair, and informed consent.

Exclusion criteria: Cases unfit for general anesthesia, Cases with systemic disorders forming a threat to life, those with complicated inguinal hernia, such as recurrence, irreducibility, and bowel obstruction, peritonitis, bowel strangulation or bowel perforation, and cases under fifteen years of age and above seventy years old.

Methods

All cases were subjected to the following:

Routine investigations were requested for all cases, including CBC, liver function tests, coagulation profile, blood sugar, kidney function tests, chest X-ray, ECG and Co-morbidities like chronic obstructive pulmonary disease, chest diseases, cardiac diseases and diabetes mellitus were treated preoperatively.

Operative techniques

The preparation for laparoscopic transabdominal preperitoneal (TAPP) hernia repair includes preoperative fasting, shaving the abdomen and groin, administering prophylactic antibiotics, and optionally inserting a Foley catheter. The case has been located supine in the Trendelenburg position, with the surgeon standing opposite the hernia. A ten-millimeter peri-umbilical trocar was used for camera insertion, and two five-millimeter trocars were placed laterally. After inspecting the inguinal regions, the peritoneum was incised two centimeters above the hernia defect and mobilized inferiorly. Dissection exposes key anatomical landmarks, including the Cooper's ligament, inferior epigastric vessels, iliopubic tract, and symphysis pubis, while avoiding nerve injuries. Hernia sacs were managed based on size, with small sacs reduced and large sacs divided distally. A 10x15 cm mesh has been located over the myopectineal orifice, secured with tackers or Cyanoacrylate-based glue, avoiding critical structures to minimize postoperative complications. The peritoneal flap was closed, and skin closure was achieved with cyanoacrylate-based glue or sutures as demonstrated in figures (1-6).

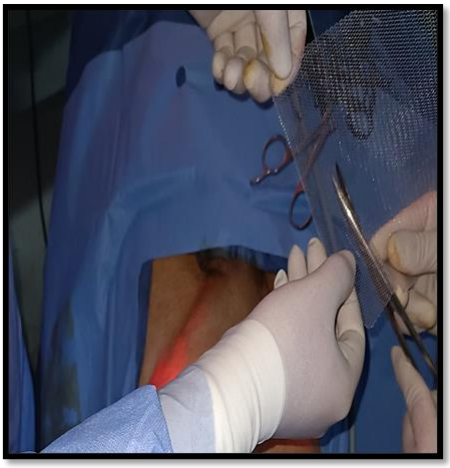

Figure 1. Mesh preparation

Figure 2. Mesh insertion

Figure 3. Preparation of Tacker

Figure 4. Mesh fixation with tuckers

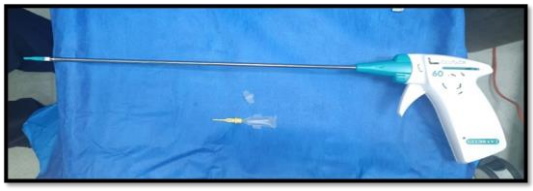

Figure 5. Preparation of applicator for cyanoacrylate-based glue

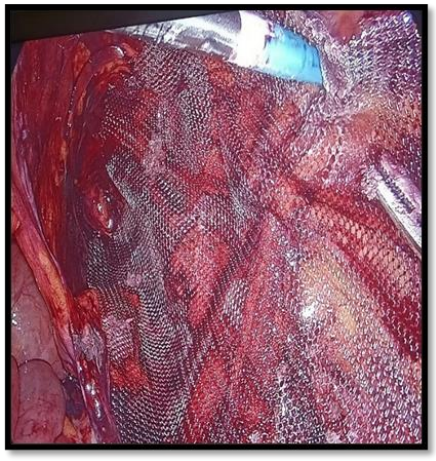

Figure 6. Mesh fixation with cyanoacrylate basis glue

Postoperative management and follow-up: Antibiotic coverage by cefotaxime twice, one dose on the introduction of anesthesia and another dose following twelve hours. All cases received a single dose of pethidine hydrochloride 50 mg intramuscular during the early postoperative period. After that, analgesia was preserved orally by nonsteroidal anti-inflammatory drugs (Diclofenac sodium 75mg) upon discharge. Cases have been discharged postoperatively, and monitoring is scheduled for all cases one week later at the outpatient clinic.

Postoperative care and complications: Postoperative complications like infection, bleeding, pain, recurrence, and urinary retention have been carefully monitored.

Discharge: Cases have been discharged on the same day or next day and named on regular monitoring for 1 week, two weeks and at the end of the month, and 6 months later.

Postoperative parameters: Postoperative outcomes were assessed using the Visual Analogue Scale (VAS) to evaluate pain on days one, ten, and thirty, documenting acute pain within 30 days post-surgery. Time to return to work was recorded, encouraging patients to resume daily and non-strenuous activities early. Chronic pain was evaluated within 6 months using the Carolinas Comfort Scale (CCS) questionnaire, licensed from Carolinas Medical Centre, Charlotte, NC. Early recurrence rates were monitored at 6 months through physical exams, ultrasound, or CT scans. Postoperative complications, whether related to fixation methods or not, were documented systematically.

Data Management and Statistical Analysis

The data collected has been analyzed and tabulated utilizing SPSS (Statistical Package for the Social Sciences) version 25 (Armonk, NY: IBM Corp) on an IBM-compatible computer. Two kinds of statistics have been done: Descriptive statistics, characterized as percentage and number, quantitative data have been represented by mean ± standard deviation, Analytic statistics: Student t-test and Chi-square test (x2). A P-value of less than 0.05 has been deemed statistically significant, and less than 0.001 for highly significant outcomes for two-tailed tests.

3. Results

There was statistically insignificant distinction among the two groups regarding gender and age (p-value more than 0.05). (Table 1)

Table 1. comparative analysis among group A and group B with regard to baseline characteristic

	GROUP A (NUMBER = 20)		GROUP B (NUMBER = 20)		TEST OF SIG.	P-VALUE
	No.	%	No.	%		
GENDER					$\chi 2$ = 0.360	0.548
MALE	19	95.0%	18	90.0%		
FEMALE	1	5.0%	2	10.0%		
AGE (YEARS)					t = 0.215	0.831
(MIN. – MAX.)	18-68		21-70			
MEAN ± SD.	47.35±15.43		46.30±15.51			

(x2): Chi-square Test t: Student T-Test p: p value for comparing among the studied groups

As intraoperative condition, there was 1 case in group B had oozing of blood and intraoperative surgical emphysema during dissection without significant distinction. (Table 2)

Table 2. comparative analysis among group A and group B with regard to intraoperative problems

INTRAOPERATIVE COMPLICATIONS	GROUPS				TOTAL		X^2	P-VALUE
	Group A (number = 20)		Group B (number = 20)					
	N	%	N	%	N	%		
NO	20	100.0%	19	95.0%	39	97.5%	1.026	0.311
YES	0	0.0%	1	5.0%	1	2.5%		

Inguinal hernia repair using Cyanoacrylate basis glue as a consumable was much cheaper than

using a tacker, as the Cyanoacrylate basis glue average price was (10,000-15,000) EGP while tacker average price was (20,000-30,000) EGP in the Egyptian market so the tacker price was about two times more expensive than Cyanoacrylate basis glue price. (Table 3)

Table 3. comparative analysis among group A and group B with regard to cost

COST	GROUPS				TOTAL		X^2	P-VALUE
	Group A (number = 20)		Group B (number = 20)					
	N	%	N	%	N	%		
LOW (10,000-15,000 L.E)	20	100.0%	0	0.0%	20	50%	36.19	<0.001*
HIGH (20,000-30,000L.E)	0	0.0%	20	100.0%	20	50%		

The pain stopped in 18(90%) of cases in group A and 16(60%) of cases in group B within 7 days of surgery, while pain was scored one in two cases in group A and scored one in five cases, and two in three cases in group B. The pain stopped in all cases in the two groups within fourteen days of surgery. (Table 4)

Table 4. comparative analysis among group A and group B with regard to pain score after 7 days

PAIN SCORE AFTER 7 DAYS	GROUPS				TOTAL		X^2	P-VALUE
	Group A (number = 20)		Group B (number = 20)					
	N	%	N	%	N	%		
0	18	90.0%	12	60.0%	30	75.0%	5.486	0.064
1	2	10.0%	5	25.0%	7	17.5%		
2	0	0.0%	3	15.0%	3	7.5%		
PAIN SCORE AFTER 14 DAYS								
0	20	100.0%	20	100.0%	40	100.0%	0.00	1.00

As regards post-operative complications in the present investigation, we found that scrotal swelling (seroma) didn't vary significantly through the examined groups. (p-value above 0.05). There were three cases fifteen percent in group B and one case five percent in group A. (Table 5)

Postoperative wound infection occurred in one patient in group B with no significant among the two groups p-value above 0.05. (Table 5)

There was insignificant among the two groups regarding recurrence as it occurred in one case only in tacker group p-value above 0.05. (Table 5)

Table 5. comparative analysis among group A and group B with regard to post-operative outcomes

	GROUPS				TOTAL		X^2	P-VALUE
	Group A (number = 20)		Group B (number = 20)					
	N	%	N	%	N	%		
SCROTAL SWELLING								
NO	19	95.0%	17	85.0%	36	90.0%	1.11	0.292
YES	1	5.0%	3	15.0%	4	10.0%		
WOUND INFECTION								
NO	20	100.0%	19	95.0%	39	97.5%	1.026	0.311
YES	0	0.0%	1	5.0%	1	2.5%		
RECURRENCE								
NO	20	100.0%	19	95.0%	39	97.5%	1.026	0.311
YES	0	0.0%	1	5.0%	1	2.5%		

Hospital stay analysis demonestrated that ninety-five percent of cases in the Cyanoacrylate basis glue group and eighty-five percent in the tacker group have been discharged on the first postoperative day, with no significant statistical distinction. On the second postoperative day, one case from the Cyanoacrylate basis glue group and three from the tacker group have been discharged due to large scrotal edema. (Table 6)

Table 6. comparative analysis among group A and group B with regard to hospital stay (days)

HOSPITAL STAY (DAYS)	GROUPS				TOTAL		X^2	P-VALUE
	Group A (number = 20)		Group B (number = 20)					
	N	%	N	%	N	%		
ONE DAY	19	95.0%	17	85.0%	36	90.0%	1.11	0.292
TWO DAYS	1	5.0%	3	15.0%	4	10.0%		

4. Discussion

In the current study, the gender has been distributed in Group A: 19(85%) males, 1(5%) female, and in Group B: 18(90%) men, 2(10%) women, with no statistically significant distinctions (p-value more than 0.05). Also, the age in Group A varied from eighteen to sixty-eight years, and the mean ± standard deviation was 47.35±15.43 years, whereas in Group B, the age varied from twenty-one to seventy years, and the mean ± standard deviation was 46.30±15.51 years. There was a statistically insignificant distinction between the two groups regarding age (p-value more than 0.05).

In accordance with our results, Hassanin et al.[6] where, whose research comprised both male and female cases, with a greater number and age distribution of men. In Group A, the mean (±standard deviation) for age was 35.80 (±12.20) years, whereas in Group B, it was 44.33 (±13.38) years. Males in their middle and older years are more likely to suffer from inguinal hernias, and the condition becomes more frequent as age advances. It is true that performing manual labor and hard lifting raises the risk of inguinal hernias.

Corresponding with our findings, the investigation of Salah et al.[7], all cases were men, ages ranging among (twenty to sixty) with mean of forty yrs. Old. The Mean± standard deviation in Group A was 29.92±7.48 years, and in Group B was 38.0±11.86 years, with a P value equal to 0.06, which is insignificant.

In our study, considering the intraoperative

problem, there was one case in group B that had intraoperative surgical emphysema and oozing of blood through dissection without significant distinction.

In our findings, inguinal hernia repair using Cyanoacrylate-based glue as a consumable was much cheaper than using a tacker, as the Cyanoacrylate-based glue average price was (10,000-15,000) EGP, while the tacker average price was (20,000-30,000) EGP in the Egyptian market, so the tacker price was about two times more expensive than the Cyanoacrylate-based glue price.

In the study of Hassanin, et al.[6] Inguinal hernia repair using Cyanoacrylate-based glue as a consumable was much cheaper than using a tacker, as the Cyanoacrylate-based glue average price was (2000) EGP, while the tacker average price was (8000) EGP in the Egyptian market, so the tacker price was about four times more expensive than Cyanoacrylate basis glue price.

In the current study, the pain score after 24 h of operation was significantly higher in the tacker group than in the Cyanoacrylate-based glue group. To control postoperative pain, all patients required two nonsteroidal analgesic injections on the first postoperative day. Following discharge, three frequent oral doses of paracetamol per day were prescribed until the patient was satisfied. The pain stopped in 18(90%) of cases in group A and 16(60%) of cases in group B within 7 days of surgery, while pain was scored one in two cases in group A, one in five cases, and two in three cases in group B. The pain stopped in all cases in the two groups within 14 days of surgery.

Similar to our results, regarding post-surgical pain incidence in Hassan et al.[8] study, they presented those two cases in Group two found with severe pain postoperative while no cases presented with severe pain in Group one. On the other hands nine cases in Group two had mild pain in contrast with two cases in Group one with high significant distinction (p-value equal to 0.00).

Based on Silva-Neto, et al.[9] results, they stated that mesh fixation with a penetrating technique (tackers) may cause a greater sensation of pain than other atraumatic methods like Cyanoacrylate basis glue fixation or mesh placement without fixation. Their findings also showed that cases in the FGG chose more pain descriptors and a greater pain index on the McGill scale than those in the NFG.

Mean and/or median VAS scores were consistently low when Cyanoacrylate-based glue against mechanical mesh fixation was utilized. Meta-analysis of VAS scores on day one showed a lower VAS score for Cyanoacrylate-based glue fixation.[10]

In our findings, as regards postoperative complications in the present investigation, we found that scrotal swelling (seroma) did not vary significantly through the groups examined. (p-value more than 0.05). There were three cases fifteen percent in group B and one case five percent in group A.

In the study of Salah et al.[7] they found that scrotal swelling (seroma) didn't vary significantly across the groups examined (p-value more than 0.05). There were two cases 16.7percent in group B and one case 8.3 percent in group A. This finding agrees with finding of Kar et al.[11] which was scrotal swelling in two cases one of them in form of seroma (6.6 percent) and another in form of hematoma (6.6 percent).

In this investigation, based on hospital stays, 19 cases (95 percent) of the Cyanoacrylate basis glue group and seventeen cases (85 percent) of the tacker group have been discharged on the first after operative day, respectively, with no statistically distinctions. On the second day after surgery, one case from group A, and three cases of group B have been discharged. This was due to large scrotal edema in case in the both groups.

This agrees with the postoperative hospitalization in Hassan et al.[8] there was no significance between groups. Nevertheless, in group II, three cases were discharged more than one day, as they were complaining of scrotal edema and pain.

In our findings, postoperative wound infection occurred in one case in group B, with no significant difference between the two groups. There was no significant difference between the two groups regarding recurrence, as it occurred in one case only in the tacker group.

In the work of Hassan et al.[8] there was no significance among groups considering postoperative wound infection and recurrence. There was only one case that demonstrated a recurrence in Group II in which the mesh had been fixed by tackers. This recurrence can be because of mesh migration or may be because of not fixing the mesh; this agrees with the outcome of Andersson et al.[12] who reported that Group I had no recurrent cases (zero percent) with mesh fixation utilizing cyanoacrylate-based glue, while Group II had one recurrent case (ten percent) with mesh fixation utilizing tackers.

In the short-term follow-up, Cyanoacrylate basis glue, as opposed to tacker mesh fixation, had the benefit of reducing postoperative discomfort and allowing for an earlier return to daily activities and work. As a safe and affordable substitute for disposable absorbent tack, Cyanoacrylate-based glue works well.

4. Conclusion

This investigation showed that laparoscopic TAPP repair is suitable for inguinal hernias due to its safety and facilitation of rapid recovery and resumption of normal activities. Mesh fixation utilizing cyanoacrylate-based glue is superior to tackers as it results in diminished postoperative pain and necessitates reduced analgesic intervention.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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