



Manuscript ID

ZUMJ-2001-1674 (R1)

DOI

10.21608/zumj.2020.16770.1674

ORIGINAL ARTICLE

Tack versus Cyanoacrylate Mesh Fixation in Laparoscopic Inguinal Hernioplasty

Doaa Omar Refaat¹, Tamer Alsaied Al naimy¹, Mohammed Ali Boghdady¹, Ahmed Metwally Mahmoud^{2}*

¹Department of General Surgery, Faculty of Medicine, Zagazig University, ² Department of

²General Surgery, student insurance hospital, Zagazig university.

***Corresponding Author:**

Ahmed Metwally Mahmoud

E-mail:

Ahmedmetwaly111111@gmail.com;

Submit Date 2020-01-21

Revise Date 2020-03-06

Accept Date 2020-04-15

ABSTRACT

Aim: The present work aimed to compare histoacryl glue versus spiral tacks mesh fixation in laparoscopic inguinal hernioplasty.

Subjects& Methods: The current study is a randomized prospective clinical trial conducted on thirty adult male patients. They were divided into two groups; group A included fifteen patients and was operated upon by laparoscopic transabdominal pre-peritoneal (TAPP) technique with fixation of the mesh with histoacryl, while group B included fifteen patients and were operated upon by TAPP with fixation of the mesh by clips. Patients were followed up by routine clinical examination for 12 months to calculate the incidence of postoperative complications and recurrence rate during the period of follow up.

Results: Mesh fixation using histoacryl glue gave superior results than fixation using tackers regarding intra-operative time, post-operative complications and post-operative pain.

Conclusions: Mesh fixation using the cheaper histoacryl glue instead of Tacks with TAPP technique

Keywords: Tack, Cyanoacrylate, Laparoscopy, Hernioplasty, ZUH.

INTRODUCTION

Inguinal hernias represent about 75% of the entire abdominal wall hernias, and with a lifetime risk of 27% in men and 3% in women. Repair of hernias is most commonly performed surgical procedures all over the world. In the USA, near 800,000 inguinal herniorrhaphies are being performed every year. Laparoscopic repair of inguinal hernia started in the early 1990s when laparoscopy gained a foothold in general surgery [1].

Although open repairs, which use tension-free mesh, remains the standard procedure, laparoscopic herniorrhaphy, in hands of skilled adequately trained surgeons, produces marvelous results compared to open repairs results. In a comparison between both procedures, 5 years postoperatively, 1.9% of patients of those who underwent laparoscopic repair continued to report moderate or severe pain, compared to 3.5% of those who had undergone open repair [2].

The last twenty years have confirmed that laparoscopic inguinal hernia surgery has more benefits including earlier return to work and reduced post-operative pain [3]. The recent study aimed to compare the safety, efficacy, post-operative pain of histoacryl versus spiral tacks mesh fixation in laparoscopic inguinal hernioplasty.

Study design

The current study is a randomized prospective clinical trial. It was conducted on thirty adult male patients presenting with inguinal hernias to surgical outpatient clinics of Zagazig University Hospitals (ZUH). They were divided into two groups; group A included fifteen patients and was operated upon by laparoscopic transabdominal preperitoneal hernioplasty technique (TAPP) with fixation of the mesh with histoacryl, while group B included fifteen patients and were operated upon by TAPP with fixation of the mesh by clips. Patients were followed up by routine clinical examination for 12 months to calculate

the incidence of postoperative complications and recurrence rate during the period of follow up.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) at the faculty of medicine, Zagazig University.

Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

METHODS

After detailed history taking, general and local clinical examination of inguinal region of patients were done.

by stopping smoking for two weeks, chest disease, diabetes mellitus, cardiac disease, hepatic disease and chronic constipation were properly managed and controlled before surgery so that all patients were properly prepared for surgery. All patients were fit for general anaesthesia. The post-operative measures included antibiotic coverage (cefotaxime at a dose of 1gm iv every 12 hours for 2 days), scrotal support as well as proper analgesics (diclofenac sodium 75 mg intramuscular in the postoperative period then analgesia was maintained by oral form of the same drug upon discharge and for 3 days' period). Patients were discharged postoperatively with follow up scheduled for all patients at definite intervals (1 week, 1 months, 4 months and 6 months) postoperatively.

Parameters of comparison included operative time and intraoperative complications. Also, postoperative pain, postoperative complications, duration of hospital stay and economic cost. In addition to the previous parameters, follow up parameters included time needed for patients to return to work and detection of recurrence. The obtained data is then statistically analyzed using suitable tests of significance [4].

The collected data were tabulated and analysed using SPSS version 24 software (SPSS Inc, Chicago, ILL Company). Categorical data were presented as number and percentages. Chi square test (X²), or Fisher's exact test

(FET) were used to analyze categorical variables. Quantitative data were tested for normality using Kolomogrov Smirnov test assuming normality at $P > 0.05$. Quantitative data were expressed as mean \pm standard deviation, median and range. Student "t" test was used to analyze normally distributed variables among 2 independent groups, or Man Whitney U test for nonparametric ones. Difference among 3 independent means was analyzed using ANOVA for parametric variables or Kruskal Wallis test (KWT) for nonparametric ones. Spearman's correlation coefficient (ρ) was used to assess correlation between non parametric variables. The accepted level of significance in this work was stated at 0.05 ($P < 0.05$ was considered significant, $P \leq 0.001$ is highly significant (HS), P value > 0.05 is non-significant (N-S).

RESULTS

Table (1): Demographic data of the whole study population.

The age of the patients included in the study ranged from 22 years to 56 years, with a mean age of 40.1 ± 9.9 years. The age of the patients included in Group A ranged from 22 years to 56 years, with a mean age of 40.0 ± 10.0 years, while the age of the patients in Group B ranged from 23 years to 55 years, with a mean age of 40.3 ± 10.2 years. No statistically significant difference could be detected between both groups as regard general data by using chi-square test & the t-test for the age as in Table (1).

Table (2): Comparison between both groups regarding the demographic data

* Independent samples Student's t-test, ‡ Linear-by-linear association test, † Chi-square test, $p < 0.05$ is significant, Sig.: significance.

No outstanding difference in both groups as regards the occupation or special habits; however, there was an increase in the incidence of inguinal hernia among smokers compared to non- smokers in our study in both groups, as 66.7% in but this result was statistically not significant as in Table (2).

Table (3): Comparison between the studied groups regarding the clinical data

In both groups, the most common presenting symptom was the presence of a swelling in the inguinal or inguinoscrotal region (63.3%)

which was encountered in 9 patients (60%) in Group A and 10 patients (66.7%) in Group B. Pain alone was the presenting symptom in just 3 patients (20%) in Group A and 2 patients (13.3%) in Group B. While heavy dragging pain associated with the presence of inguinal or inguinoscrotal swelling was the presenting symptom in 3 patients (20%) in Group A and the same in Group B. Also, right sided inguinal hernias represented 53.3% of group A cases (8 patients); while left sided inguinal hernias were 46.7% (7 patients). On the other hand, right sided inguinal hernias represented 66.7% of group B cases (10 patients); while left sided inguinal hernias were 33.3% (5 patients).

Table (4): Comparison between the studied groups regarding the operative data.

Mann Whitney U test, ‡F Fisher’s Exact test, p< 0.05 is significant, Sig.: significance. No outstanding difference in both groups as regards the intra-operative data except for

operative time which was significantly decreased in Group A.

Table (5): Comparison between the studied groups regarding the post-operative data.

‡ Linear-by-linear association test, ‡ Chi-square test, p< 0.05 is significant, Sig.: significance.

No outstanding difference in both groups as regards the post-operative data between both groups.

Concerning the remaining postoperative data, the current study revealed that all cases returned to full activity by two weeks postoperative. Also, no cases of recurrence in both groups was noticed during the relatively short period of follow up. In addition, the cost of the procedure was much less in group A than Group B (The price of a single disposable titanium tacker applicator is about 4500 LE for a single patient while the cost of histoacryl ampoule is about 400 LE for a single patient).

Table 1: Demographic data of the whole study population.

Demographic data	All patients
Count (%)	30 (100%)
Age (years)	
Mean ± SD	40.1 ± 9.9
Median (Range)	40 (22 – 56)
Type of work	
Sedentary	7 (23.3%)
Moderate manual	9 (30%)
Heavy manual	14 (46.7%)
Smoking	
Non-smoker	10 (33.3%)
Smoker	20 (66.7%)

Table 2: Comparison between both groups regarding the demographic data

Demographic data	Group A	Group B	Test	P-value (Sig.)
Count	15	15		
Age (years)				
Mean ± SD	40.3 ± 10.2	40.0 ± 10.0	0.072 *	0.943 (NS)
Type of work				
Sedentary	3 (20%)	4 (26.7%)	0.050 ‡	0.823 (NS)
Moderate manual	5 (33.3%)	4 (26.7%)		
Heavy manual	7 (46.7%)	7 (46.7%)		
Smoking				
Non-smoker	5 (33.3%)	5 (33.3%)	<0.001 ‡	1.000 (NS)
Smoker	10 (66.7%)	10 (66.7%)		

Table 3: Comparison between the studied groups regarding the clinical data

Clinical data	Group A	Group B	Test	P-value (Sig.)
Count	15	15		
Presenting symptoms				
Swelling	9 (60%)	10 (66.7%)	0.253 ‡	0.881 (NS)
Pain	3 (20%)	2 (13.3%)		
Swelling & pain	3 (20%)	3 (20%)		
Site of hernia				
Right	8 (53.3%)	10 (66.7%)	<0.001 ‡	1.000 (NS)
Left	7 (46.7%)	5 (33.3%)		

Table 4: Comparison between the studied groups regarding the operative data.

Operative data	Group A	Group B	Test	P-value (Sig.)
Count	15	15		
Operative time (min)				
Median (Range)	48 (37 – 100)	85 (45 – 120)	-2.160 •	0.029 (S)
Intra-operative complications				
No complications	14 (93.3%)	13 (86.7%)	‡ ^F	1.000 (NS)
Too much dissection	1 (6.7%)	2 (13.3%)		

Table 5: Comparison between the studied groups regarding the post-operative data.

Post-operative data	Group A	Group B	Test	P-value (Sig.)
Count	15	15		
Hospital stay duration				
< 24 hours	12 (80%)	11 (73.3%)	0.492 ‡	0.483 (NS)
24 – 48 hours	3 (20%)	3 (20%)		
> 48 hours	0 (0%)	1 (6.7%)		
Post-operative pain				
No pain	12 (80%)	8 (53.3%)	2.419 ‡	0.298 (NS)
1st 48 hours	2 (13.3%)	5 (33.3%)		
One-week post-operative	1 (6.7%)	2 (13.3%)		

DISCUSSION

The optimal technique for effective inguinal hernia repair is still controversial. Although open tension-free mesh techniques of inguinal hernia repair offer good results, the laparoscopic technique has been reported as superior for postoperative pain, discomfort, and more rapid return to normal activities [5].

The laparoscopic trans-abdominal preperitoneal inguinal hernioplasty technique

(TAPP) approach to groin hernias gains access to the preperitoneal space without the associated pain and morbidity of a larger incision, and it potentially allows for a more rapid recovery. Because the TAPP inguinal hernia repair requires entry into the abdomen, possible complications related to violating the abdominal cavity (bowel perforation and intestinal ileus or obstruction) have been reported. However, the ability to repair

unilateral, bilateral, or recurrent defects through 3 small cosmetic incisions (10, 5, and 5 mm, respectively); with early return to normal activities makes laparoscopic repair an attractive surgical option [6].

Various techniques of mesh fixation have been described including running sutures and adhesive glues. Sutures require proper placement that may consume time when compared with the fast easy-applicable glues. Glues have the ability to fix the mesh until fibrosis takes place then degrades facilitating its absorption by body [7].

In the present study, there was no significant difference between both groups concerning personal history (age, occupation and smoking habit) as the mean age in groups A was 40.3 ± 10.2 years compared with 40.0 ± 10.0 in group B. However, the incidence of inguinal hernia among whole smokers (20/30; 66.7%) was higher in an insignificant manner compared with the non-smokers (10/30; 33.3%) in the whole study sample. Sørensen et al. [8] agreed with current results as they declared that smoking is a possible risk factor in the incidence of hernia. Franz [9] explained that smoking can be blamed for impairing normal collagen metabolism as well as deficiency of the extra-cellular matrix leading to weakening of tissues with subsequent development of primary and incisional hernia. However, Chandra et al. [10]—among their 100 cases who were operated by laparoscopic hernia surgery in Poona Hospital and Research Centre between October 2012 and November 2014; half of them was done with tacks and the other half with glue- found that only 32 patients were smoker compared with 68 non-smoker patients.

In the recent work, there was no significant difference between both groups concerning presenting symptoms (swelling was the most frequent presenting symptom representing (9/15; 60%) in group A and (10/15; 66.7%) in group B) or the site of hernia (Right sided hernia was more evident in both groups representing (8/15; 53.3%) in group A and (10/15; 66.7%) in group B). Regarding presenting symptoms of inguinal hernia, LeBLANC et al. [11] agreed with the current results as they reported that heaviness and

swelling are the first presenting symptoms of inguinal hernia.

In the current work, the operative time was significantly reduced in group A (median= 48 minutes) compared with group B (median= 85 minutes). This finding can be explained by the ease of application of histoacryl for mesh fixation compared with tacks which require proper attention to the surrounding anatomy and proper placement sites which gives superiority for histoacryl over spiral tacks. However, Jani [12] who investigated the operative time for 127 patients who underwent mesh fixation with sutures and 124 others who underwent mesh fixation with histoacryl—both groups were operated upon by a single surgeon between January 2009 and March 2012- and stated that, although fixation with histoacryl consumed operative time (48 ± 8.9 minutes) less than sutures (4 ± 9.2 minutes), the difference is still statistically insignificant. Also, Chandra et al. [10] reported an insignificant decrease in the operative time between glue fixation (50.3 ± 4.05 minutes) and tacks (54.9 ± 5.79). However, this disagreement may be explained by the small sample size of the current work.

In the present study, the only intra-operative difficulties was excessive dissection observed in only three cases (single case in group A and two cases in group B). This excessive dissection was the result of the unclear anatomy and the presence of adhesions which hindered usual procedure and required more dissection to get a clear view and thus avoiding injury to adjacent highly-valuable adjacent structures. Regarding this outcome, it is important to mention that none of the three case required converting into open surgery. Also, it is valuable to report no significance difference between both groups concerning the intra-operative complication. Jani [12] as well as Chandra et al. [10] agreed with the current finding as they declared no significant difference between using histoacryl or tacks regarding intra-operative complication. Also, none of the investigators in both studies reported a need to convert any operation into open surgery.

In the present study, no significant difference between both groups concerning the

post-operative hospital stay was reported as (12/15; 80%) in group A and (11/15; 73.3%) in group B stayed less than 24 hours. This finding agreed with that of Jani [12] who declared that nearly all patients were discharged in less than 24 hours without any significant difference between using histoacryl or tacks in mesh fixation. Although Chandra et al. [10] reported no significant difference between using histoacryl or tacks in mesh fixation, they reported longer duration of hospital stay that exceeded two days (2.14 ± 0.35 days in patients whose meshes were fixed with glue and 2.38 ± 0.60 days in those with tacks).

In the current work, neither early nor late post-operative complications were faced in both groups except for single case in group A that developed urine retention relieved by supra pubic hot fomentations. Jani [12] also reported no significant difference between fixation of mesh with histoacryl or tacks regarding post-operative complications, however they declared three cases of urine retention (single case in individuals who underwent mesh fixation with histoacryl and two cases in those who underwent mesh fixation with tacks), while Chandra et al. [10] disagreed with the current study results and reported statistically significant lower incidence of post-operative urinary retention in individuals who underwent mesh fixation with glue (6/50;12%) compared with those who underwent mesh fixation with tacks (17/50;34%). The previous author added that also post-operative hematoma statistically significant lower incidence in mesh fixation with glue (0/50;0%) compared with tacks (4/50;8%).

Regarding the economic point of view, histoacryl was found to be incomparably more economic than staples by about 90%.

In the recent study, an insignificant decrease in the development of post-operative pain in group A (12/15; 80% of cases developed no post-operative pain) compared with (8/15; 53.3% of cases developed no post-operative pain) in group B. This finding is concomitant with that of Subwongcharoen and Ruksakul [13] who reported statistically significant lower incidence of post-operative

pain in mesh fixation with histoacryl compared with tacks. In addition, Jani [12] mentioned that post-operative pain wasn't significantly different in the first 48 hours between both types of mesh fixation. The previous author added that a rapid relief in histoacryl mesh-fixed patients was noticed. Also, Chandra et al. [10] reported no significant difference between both types of mesh fixation regarding post-operative pain.

In the present study, no significant difference between both groups concerning time needed to return to full activity (9 ± 4.5 day in group A and 11 ± 2.5 in group B but all cases were able to return to work by two weeks) as well as postoperative recurrence of hernia (no cases of recurrence in both groups were faced). Jani [12] agreed with the present study results as they declared no cases of recurrence in fixation with histoacryl or tacks. Chandra et al. [10] agreed with the current results as they reported no significant difference between both types of mesh fixation recurrence (no cases of recurrence were noted), however they reported statistically significant lower time need to return to work in individuals who underwent mesh fixation with histoacryl (34/50;68% of cases required 15 days) compared with tacks histoacryl (23/50;46% of cases required 15 days).

Eventually, the present work confirmed that no statistically significant difference between mesh fixation using histoacryl or spiral tacks except for operative time that was significantly lower with using histoacryl. Also histoacryl use in mesh fixation decreased the development of post-operative pain as well as the post-operative hospital stay in an insignificant manner, however if combined with the extremely-economic price, it gives superiority for histoacryl over tacks in mesh fixation.

Conflict of interest: Non

Financial support: Non

REFERENCES

1. Barbaro A, Kanhere H, Bessell J, Maddern GJ. Laparoscopic extraperitoneal repair versus open inguinal hernia repair: 20-year follow-up of a randomized controlled trial. *Hernia* 2017; 21(5): 723-7.
2. Shaiban MA, Khushaim LM, Alghamdi RK, Alawami FM, Jamalaldeen MR, Aljoufi GA, Abdulrahman AY, et al. Laparoscopic versus Open Inguinal Hernia Repair

- in Adults. *EJHM* 2018; 70(3): 392-7.
3. Ross SW, Oommen B, Kim M, Walters AL, Augenstein, VA, Heniford BT. Tacks, staples, or suture: method of peritoneal closure in laparoscopic transabdominal preperitoneal inguinal hernia repair effects early quality of life. *Surg Endosc*, 2015- 29(7): 1686-1693.
 4. Levesque RM, Levesque R. *SPSS® Programming Data Management. A Guide for SPSS® and SAS® Users*, 2005 2nd ed. Chicago, IL, USA SPSS Inc
http://www.spss.com/spss/data_management_book.htm
 5. Kumar P, Kumar N. Trans abdominal pre-peritoneal versus totally extra-peritoneal laparoscopic techniques for inguinal hernia repair: a comparative study. *ISJ* 2016; 4(1): 162-5.
 6. Soler M. The minimal open preperitoneal (MOPP) approach to treat the groin hernias, with the history of the preperitoneal approach. *ALES* 2017; 2: 8.
 7. Gupta A, Mazari F, Samuel N, Balchandraet S. Mesh fixation techniques for laparoscopic inguinal hernia repair in adults. *CDSR* 2017; (10).
 8. Sørensen LT, Hemmingsen UB, Kirkeby LT, Kallehave F, Jørgensen LN. Smoking is a risk factor for incisional hernia. *ARCH SURG* 2005; 140(2): 119-123.
 9. Franz MG. The biology of hernia formation. *Sur Clin N Am* 2008; 88(1): 1-15.
 10. Chandra P, Phalgune D, Shah S. Comparison of the clinical outcome and complications in laparoscopic hernia repair of inguinal hernia with mesh fixation using fibrin glue vs tackler. *Indian J Surg* 2016; 78(6): 464-470.
 11. LeBLANC KE, LeBLANC LL, LeBLANC KA. Inguinal hernias: diagnosis and management. *Am Fam Physician* 2013; 87(12): 844-8.
 12. Jani K. Randomised controlled trial of n-butyl cyanoacrylate glue fixation versus suture fixation of mesh in laparoscopic totally extraperitoneal hernia repair. *J Min Access Surg* 2016; 12(2): 118-123.
 13. Subwongcharoen S, Ruksakul K. A randomized controlled trial of staple fixation versus N-butyl-2-cyanoacrylate fixation in laparoscopic inguinal hernia repair. *J Med Assoc Thai* 2013; 96: S8-13.

Refaat, D., Al naimy, T., Boghdady, M., Metwaly, A. Tack Versus Cyanoacrylate Mesh Fixation in Laparoscopic Inguinal Hernioplasty. *Zagazig University Medical Journal*, 2022; (679-685): -. doi: 10.21608/zumj.2020.16770.1674