

Non-absorbable versus absorbable tacks in transabdominal preperitoneal laparoscopic repair of inguinal hernia

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ABSTRACT

Background: Groin hernia repair is considered to be one of the most commonly performed operations by general surgeons however, there is no "gold standard" operation for treatment of inguinal hernias. The optimal surgical approach must be selected individually for the patient, considering patient age, hernia size, unilaterality or bilaterality, primary or recurrent status, and type of anesthesia, occupation, and leisure activities. The laparoscopic revolution has increased the debate about the safest and most effective inguinal hernia repair. This revolution has broadened our understanding of inguinal anatomy and hernia repair. At the least, surgeons should be aware of the current indications and contraindications for laparoscopic inguinal hernia repair, because some hernias should have a laparoscopic repair. To increase versatility, surgeons should consider becoming skilled at both techniques, with the understanding that outcomes are optimal if one is committed to achieving expertise in laparoscopic repair.

Objectives: Our objective in this study is to compare the outcome of mesh fixation using non-absorbable tacks versus absorbable tacks in transabdominal preperitoneal (TAPP) laparoscopic repair of inguinal hernia regarding their efficacy and postoperative complications to improve the outcome of patients undergoing surgery for inguinal hernia in Ain Shams University Hospitals.

Patients and methods: The present study is a prospective, randomized comparative study that was conducted in Ain Shams University Hospitals in Egypt, and included sixty (60) patients who had inguinal hernia. The patients were divided into two groups each group including 30 patients. In the first group (Group A) titanium non-absorbable tacks were used and in the other group (Group B) absorbable tacks were used. The patients underwent a trans-abdominal preperitoneal (TAPP) laparoscopic repair of inguinal hernia using prolene mesh. The study was conducted from July 2016 to July 2017, with 12 months of follow-up post-operatively until July 2018.

Results: The mean age of the patients was 36.93 ± 10.23 (19-55) and the mean BMI was 24.83 ± 2.79 (19-32). There was no significant difference between 2 groups as regard preoperative comorbidities. Patients presented mainly with swelling in the groin region 71.67%. Right sided hernia was 46.7% and bilateral hernia was 15%. There was no difference between 2 groups as regard the operative time (p-value=0.056) and intraoperative complications: bleeding (p-value=0.150) and bladder injury (p-value=0.313). Post-operative complications, postoperative hospital stay, time needed to return to normal activity and the recurrence were all alike between the 2 groups. Pain analysis was done four times, and revealed no significant difference between the 2 groups at any time of follow-up.

Conclusion: Both non-absorbable tacks and absorbable tacks used in mesh fixation are similarly effective in terms of operative time, the incidence of recurrence, complications and pain at least in the first year of follow up, but it may be less painful after one year after the complete absorption of the absorbable tacks but this needs further investigations and studies containing more patients and with follow-up for longer time.

Keywords: Laparoscopic hernia repair, Transabdominal preperitoneal hernia repair, Non-absorbable tacks, Titanium tacks, Absorbable tacks, Postoperative pain.

INTRODUCTION

Inguinal hernias account for 75% of all abdominal wall hernias, and with a lifetime risk of 27% in men and 3% in women. Repair of these hernias is one of the most commonly performed surgical procedures in the world⁽¹⁾.

Although open, mesh-based, tension-free repair remains the criterion standard, laparoscopic herniorrhaphy, in the hands of

adequately trained surgeons, produces excellent results comparable to those of open repair⁽²⁾.

Studies have listed specific indications for laparoscopy over open repair, including recurrent hernias, bilateral hernias, and the need for earlier return to full activities⁽³⁾.

Several studies have demonstrated salutary outcomes for laparoscopic repair of

recurrent hernias. Re-recurrence rates may decline to 5% or lower with laparoscopic repair, compared with rates as high as 20% for anterior repair⁽⁴⁾.

The reduced pain after laparoscopic inguinal hernia repair as compared with conventional anterior repair makes laparoscopy the approach of choice for bilateral hernias⁽⁵⁾.

In a comparison between open repair and laparoscopic repair, *Eklund et al.* found that 5 years after operation, 1.9% of patients who had undergone laparoscopic repair continued to report moderate or severe pain, compared with 3.5% of those who had undergone open repair⁽⁶⁾.

In laparoscopic inguinal hernia repair, the hernia defect is approached from its posterior aspect and the repair involves placing mesh in the preperitoneal space. The anatomic approach to the preperitoneal space depends upon the laparoscopic technique used for hernia repair. The two commonly used approaches to laparoscopic repair of inguinal hernias are the transabdominal preperitoneal hernia repair (TAPP) and the totally extraperitoneal hernia repair (TEP) approaches⁽⁷⁾.

In the TAPP method, intra-abdominal synthetic mesh is fixed via different methods. Most frequently, mesh fixation is accomplished with the use of a stapler that delivers tackers. Tackers not only reduce the hazard of mesh migration, they also maintain the optimum strength of the repair. However, neuralgia resulting from nerve entrapment in tackers has been reported⁽⁸⁾.

Mesh fixation using staplers includes metallic fixation devices which provide greater fixation strength but can cause serious complications such as adhesion formation or tack erosion into hollow viscera⁽⁹⁾.

On the other hand, absorbable fixation devices which are bioabsorbable provide less complication but less fixation strength over time⁽¹⁰⁾.

Although studies comparing between laparoscopic versus open hernia repair have been previously conducted in various types of hernia including inguinal, umbilical and ventral hernias, comparing between methods of mesh fixation in laparoscopic repair have not yet been well analyzed, hence, the aim of this study.

AIM OF THE WORK

The aim of this study is to compare the outcome of mesh fixation using non-absorbable tacks versus absorbable tacks in transabdominal preperitoneal (TAPP) laparoscopic repair of inguinal hernia regarding their efficacy and postoperative complications to improve the outcome of patients undergoing surgery for inguinal hernia in Ain Shams University Hospitals.

PATIENTS AND METHODS

The present study is a prospective, randomized comparative study that was conducted in Ain Shams University Hospitals in Egypt, and included sixty (60) patients who had inguinal hernia. The patients were divided into two groups each group including 30 patients. In the first group (Group A) titanium non-absorbable tacks were used and in the other group (Group B) absorbable tacks were used. The patients underwent a transabdominal preperitoneal (TAPP) laparoscopic repair of inguinal hernia using prolene mesh. The study was conducted from July 2016 to July 2017, with 12 months of follow-up post-operatively until July 2018. **The study was approved by the Ethics Board of Ain Shams University.**

Inclusion Criteria:

Patient (18 – 60 years) with reducible inguinal hernia (e.g. male or female, unilateral or bilateral, oblique or direct) was included in the study.

Exclusion Criteria:

- Patients unfit for general anesthesia e.g.: ASA III, IV or V.
- Patients with prior pelvic surgery or surgery in the preperitoneal space.
- Patients with recurrent hernias.
- Patients with complicated inguinal hernia
- Patients younger than 18 or older than 60.

Pre-operative assessment:

Full clinical history and clinical examination (general and local), routine pre-operative blood tests (complete blood picture, coagulation profile, liver and kidney functions tests), plain chest x-ray, ECG and echocardiography (if indicated).

Outcome Assessment:

- Operative time: operative time was calculated starting by incising the peritoneum till deflating the abdomen using the recorded videos of the operations.

- Intraoperative complications as: intraoperative bleeding and intraoperative bladder injury
- Early postoperative pain: using visual analogue pain score (from 1 to 10) during the 1st postoperative day.
- Return to normal activity.
- Postoperative hospital stay.
- Frequency and type of analgesics required.
- Inguinoscrotal edema
- Port site Infection
- Late postoperative pain: at 2 weeks, 6 months, 1 year using the visual analogue pain score and the need for analgesics are assessed.

- Recurrence

Statistical Analysis:

Continuous variables are expressed as mean and Standard Deviation. Categorical variables are expressed as frequencies and percents. Student t Test was used to assess the statistical significance of the difference between two study group mean. Chi square and Fisher’s exact test was used to examine the relationship between Categorical variables. A significance level of $P < 0.05$ was used in all tests. All statistical procedures were carried out using SPSS version 24 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS

Table (1): Distribution of cases according to comorbidities.

Co morbidity		Total		Group A Non-Absorbable tacks		Group B Absorbable tacks		Test value *	P-value
		No.	%	No.	%	No.	%		
DM	No	49	81.7%	24	80%	25	83.3%	0.111	0.739
	Yes	11	18.3%	6	20%	5	16.7%		
HTN	No	57	95%	28	93.3%	29	96.7%	0.351	0.554
	Yes	3	5%	2	6.7%	1	3.3%		
COPD	No	50	83.3%	24	80%	26	86.7%	0.480	0.488
	Yes	10	16.7%	6	20%	4	13.3%		

P-value >0.05: Non-significant; P-value <0.05: Significant; P-value < 0.01: highly significant
*: Chi-square test

This study involved 60 male patients who were divided into 2 equal groups comparing between titanium non-absorbable tacks (Group A) and absorbable tacks (Group B). The mean age of the patients was 36.93 ± 10.23 (19-55) and the mean BMI was 24.83 ± 2.79 (19-32).

The associated comorbidities were Diabetes Mellitus, Hypertension and Chronic Obstructive Pulmonary Diseases, as regard Diabetes Mellitus (DM), six patients (20%) were diabetics in Group A, and five patients (16.7%) were diabetics in Group B, and as regard hypertension (HTN), two patients (6.7%) were hypertensive in Group A and only 1 hypertensive patient (3.3%) in group B. Ten patients out of sixty patients were suffering from Chronic Obstructive Pulmonary Disease

(COPD) (16.7%), six patients (20%) were in Group A and four patients (13.3%) in Group B. None of these comorbidities was severe and all patients’ conditions were controlled by medical treatment and optimized preoperatively. No statistically difference between 2 groups could be detected as regard DM (p-value = 0.739), HTN (p-value = 0.554) or COPD (p-value = 0.488), (table 1).

Patients presented mainly with swelling in the groin region 71.67%. Right sided hernia was 46.7% and bilateral hernia was 15%. There was no difference between 2 groups as regard the operative time (p-value=0.056) and intraoperative complications: bleeding (p-value=0.150) and bladder injury (p-value=0.313).

Table (2): Early Postoperative Complication.

Early postoperative complication		Total		Group A Non-Absorbable tacks		Group B Absorbable tacks		P-value	Sig.
		N	%	N	%	N	%		
Inguinoscrotal edema	Yes	3	5 %	2	6.67 %	1	3.33%	1.000*	NS
	No	57	95 %	28	93.33%	29	96.67%		
Port site infection	Yes	1	1.67 %	0	0 %	1	3.33%	1.000*	NS
	No	59	98.33%	30	100 %	29	96.67%		

*Fisher exact test

There was no significant difference between both groups as regard the early postoperative complication (table 2), as we found that inguinoscrotal edema occurred in 2 patients (6.67%) in Group A and in 1 patient (3.33%) in Group B. The port site infection was found in the 1 patient (3.33%) of Group B, there was no significant difference between both groups (p-value = 1.000) (table 2).

Pain analysis was done four times, the first at the 1st day postoperative, then at 2 weeks, 6 months and 1 year, by comparing the data it was found that there is no statically significant difference between the pain in the 2 groups at any time of follow-up.

There were no cases of recurrence in either group during the follow- up period of 12 months.

Table (3): Postoperative pain assessment

		Total	Group A Non-Absorbable tacks	Group B Absorbable tacks	Test value	p-value
Pain - 1st day (VAS score)	Mean ± SD	3.9 ± 1.75	3.93 ± 1.41	3.87 ± 2.06	0.146*	0.884
	Range	1 – 8	1 – 7	1 – 8		
Pain - 2 weeks (VAS score)	Mean ± SD	3.17 ± 1.34	3.43 ± 1.52	2.90 ± 1.09	1.557*	0.125
	Range	0 – 6	0 – 6	0 – 5		
Pain - 6 months (VAS score)	Mean ± SD	1.78 ± 1.12	2.03 ± 1.29	1.53 ± 0.86	1.757*	0.084
	Range	0 – 4	0 – 4	0 – 3		
Pain -12 months (VAS score)	Mean ± SD	0.32 ± 0.47	0.37 ± 0.45	0.27 ± 0.49	1.474*	0.067
	Range	0 – 1	0 – 1	0 – 1		

P-value >0.05: Non-significant; P-value <0.05: Significant; P-value< 0.01: highly significant

*: Independent t-test - **: Mann-Whitney U test

DISCUSSION:

Laparoscopic repairs provide very good results as it has lower postoperative pain, fewer wound infection, and quick return to daily activity⁽¹¹⁾.

A meta-analysis comparing between the laparoscopic repair versus open Lichtenstein procedure showed that significantly fewer patients with chronic pain were found in the laparoscopic group. Patients treated by laparoscopy had a significantly earlier return to normal daily activities than

patients of the Lichtenstein group but the main disadvantage of laparoscopic repair has been the duration of the operation as the mean operative time was significantly longer in the laparoscopic operations⁽¹²⁾.

The transabdominal pre-peritoneal (TAPP) repair involves standard laparoscopy with access into the peritoneal cavity and placement of a large mesh along the anterior abdominal wall, thereby repairing the hernia posterior to the defect. This technique was the

first laparoscopic hernia repair to be performed⁽¹³⁾.

Mesh must be fixed after its placement, the current surgical choices for that include tacks (titanium or absorbable), sutures, staples, self-fixing meshes and other glues. However, there is no consensus on the best surgical technique and the choice of options often depends on surgeons' personal preference⁽¹⁴⁾.

Titanium tacks have traditionally been used to fix the mesh and can also be used to close the peritoneal flap. However, a 2011 study revealed that acute pain rate increased when more than 10 tacks were placed. So, a number of surgeons have now switched to using absorbable tacks to fix the mesh and close the peritoneum instead of the titanium tacks⁽¹⁵⁾.

The use of absorbable tacks appears to cause less long-term complications than the titanium tacks and tend to reabsorb within one year⁽¹³⁾.

In our study patients in both groups were similar as regard the age, the patients ages ranged from 19 to 55 years, all were male patients.

The same age group was observed in an Indian study which studied inguinal hernia risk factors, it stated that the most common patients suffered from inguinal hernia ranged from 20-60 years old⁽¹⁶⁾.

All studied patients were males to matches the male predominance as regards the patient's flow for recruitments and this predominance of hernia in males was attributed to the fact that there was involvement of more strenuous exercises and lifting of weights by them and the anatomical differences between the two genders⁽¹⁷⁾.

Different kinds of inguinal hernias were included as primary indirect inguinal hernia was the most common type encountered in our study with 49 patients (81.67%) while primary direct inguinal hernia was encountered in 8 patients (13.33%), combined hernia (pantaloon) found in 3 patients (5%), that coincides with the inguinal hernia distribution in a recent monocentric study with balanced randomization of 60 patients designed to compare the TAPP approach with self-gripping mesh to the TAPP repair with polypropylene mesh with biological fibrin glue fixation, the study population contained 85% primary indirect inguinal hernia and only

13.33% direct type confirming that primary indirect inguinal hernia is the most common type of inguinal hernia⁽¹⁸⁾.

As regard the intraoperative complication we had 2 cases of intraoperative bleeding, both were in Group A and were due to injury of the inferior epigastric vessel and required applying proximal as well as distal clips to control the bleeding. We had also a bladder injury occurred during dissection in one case, it was in Group B, it was managed by intra-corporeal stitches using interrupted absorbable sutures and postoperative catheterization for 2 weeks. No statically significant difference between both groups as regard the complication.

Using the visual analogue scale for pain VAS, we found that the mean score of pain decreased from (3.93 ± 1.41) in Group A and from (3.87 ± 2.06) in Group B in the 1st postoperative day to (0.37 ± 0.45) in Group A and to (0.27 ± 0.49) in Group B after 1 year, no statically significant difference between the 2 groups was found.

In a multicenter study assessing the use of absorbable tacks as regard postoperative pain revealed that at 1 month, 90% of patients were totally pain-free (VAS score: 0) and only ten patients reported low pain (VAS scores: 0.3-3.1). At 1 year, the pain described by those ten patients finally disappeared, 98% of patients were totally pain-free⁽¹⁹⁾.

The International Endo-hernia Society, which is based in Germany, revealed its evidence-based guidelines and came to that there is very little literature about the role of absorbable fixing devices and stressed the need for further research about it⁽²⁰⁾.

The current study has some limitation related to the relatively small number of pooled patients and to overcome this limitation, we recommend a further study on a larger scale with larger number of study population. Also, considering the little difference between both techniques in terms of clinical outcomes, the cost-effectiveness of each technique would be an important outcome determining which technique should be used. Moreover, our sample included patients with primary hernia, these findings cannot thus be applied with certainty to patients with recurrent hernias. The average follow-up of just 12 months which is reasonable for detecting early recurrences but prevent us from evaluating late recurrences.

CONCLUSION:

In conclusion, both non-absorbable tacks and absorbable tacks are similarly effective in terms of operative time, the incidence of recurrence, intra-operative complications, post-operative complications and chronic pain, further studies are needed with more patients and longer follow-up.

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