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A Comparison Study of the Efficacy of Tacker Mesh Fixation, Glue Mesh Fixation and No Mesh Fixation in Transabdominal Preperitoneal Inguinal Hernia Repair

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ABSTRACT

The minimally invasive laparoscopic techniques include transabdominal preperitoneal (TAPP) and total extraperitoneal hernioplasty (TEP). In our study we compare outcomes including hernia recurrences rate and chronic inguinal pain, following mesh fixation using histoacryl glue versus tacker versus no mesh fixation in TAPP. The intensity of postoperative pain was assessed with the Carolinas Comfort scale (CCS). In the study, Proceed Surgical mesh was exclusively used. Tree groups of patients based on the type of mesh fixation: group (A) fixed with histoacryl glue group (B) fixed with resorbable tackers and the third (C) group without fixation were compared. The study included 59 male patients from 26 to 76 years old, who underwent 85 hernioplasty using the TAPP technique. The subjects in the study were divided in three groups: group (A) consisting of 29 hernias, group (B) and (C) - with 28 hernias each. Participants in the study were followed up at 3, 12 and 24 months. There was no statistically significant difference in the hernia recurrence between the three groups. The overall hernia recurrence rate was 3.5%. One recurrence was noted in group A at 3 months postoperatively. The second recurrence occurred in B group after 15 months from the index surgery and the third recurrence in C group occurred after 12 months. Two patients in group A had a postoperative haematoma of the scrotum, managed conservatively. Our study showed that the type of mesh fixation does not increase the risk of inguinal hernia recurrence or chronic postoperative pain. However, the site of mesh fixation is important and should not be fixed at the level of the triangles of pain and doom.

Keywords: ***Inguinal*** *hernia repair; Laparoscopic hernioplasty; TAPP; tacker; glue*

Introduction

Inguinal hernia repair is probably the most commonly performed procedure in general surgery worldwide. There are two main approaches for inguinal hernia repair- these are broadly divided into classical and laparoscopic techniques. The minimally invasive laparoscopic techniques are transabdominal preperitoneal (TAPP) and total extraperitoneal hernioplasty (TEP). In our study we used the standard TAPP laparoscopic technique.

Patients and Method

Study was performed as a prospective double-blinded, two-site study of patients undergoing TAPP hernioplasty. It was conducted at the department of abdominal surgery in General Hospital Celje and General Hospital Slovenj Gradec between January 2013 to May 2014.Patients details were anonymise and given a study number. Also the surgeons who performed the operations, did not made any study follow up after the surgery, the follow up was made by a researcher of the study. Written consent was obtained from all patients.

The study included 59 male patients from 26 to 76 years old, who underwent 85 hernioplasty using the TAPP technique. All hernias were primary, and we did not include any recurring hernias. The subjects in the study were divided in three groups: a group (A) of 29 hernias fixed with histoacryl glue, a group (B) of 28 hernias fixed

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with resorbable tackers and the third (C) group 28 hernias without fixation.

We used Proceed surgical mesh (Ethicon Inc., Somerville, NJ, USA) - a combination of large-pore, monofilament mesh and natural, absorbable tissue-separating technology in all patients. The mesh is composed of an oxidized regenerated cellulose fabric (ORC), a nonabsorbable polypropylene mesh which is encapsulated by a polydioxanone polymer. It is engineered to minimise adhesion, has partially absorbable qualities. The size of mesh 10X15 cm was used in hernias of size L1, 2/ M1, 2 and 15x15 cm in hernias of size L3/M3.

The aim of our study was to compare outcomes, hernia recurrence rates and postoperative chronic inguinal pain between three different methods for mesh fixation in TAPP hernioplasty: these include using histoacryl glue versus tacker versus no mesh fixation. Tacker was fixed on lower medial edge of the mesh, and we used tacks on Cooper ligament. Medial side of mesh overlapped the lateral side muscular recuts abdominis and is fixated in that area. Upper edge of the mesh was fixed into aponeurosis of musculus transversus and fascia of musculus recuts abdominis. We used 3 or 4 tacks. The mesh was not fixed in the area of triangle of pain and doom. Peritoneum was sutured with V-lock suture. The intensity of postoperative pain was assessed with the use of Carolinas Comfort scale (CCS).

Participants in the study were followed up at 3, 12 and 24 months. At every time point we used clinical examinations to assess objective outcomes. If there was suspicion of a recurrence, an ultrasound assessment was undertaken. We assessed the rate of inguinal hernia recurrence in all groups. Chronic postoperative pain was measured with the use of *Carolinas Comfort Scale* (CCS). Pain intensity was assessed on a scale from 0 to 5 in the following activities: lying down, bending, sitting, daily activities, coughing or deep breathing, walking or standing, climbing stairs and exercising. We also compared the degree of pain pre - and postoperatively at 3, 12 and 24 months. Written consent was obtained from all participants.

Statistical analysis

Variables were compared using Chi-square test, Fisher's t-exact test, Pearson correlation, Student's t test, ANOVA with Games-Howell posthoc test. The analysis was performed with SPSS version 22 (IBM corporation, USA). P-value of <0.05 was considered statistically significant.

Results

The median age of patients was 52.4 years (range 26-76). A total of 33 (38.8%) patients had unilateral inguinal hernias (22 right and 11 left), 18 were direct and 15 were indirect, and 26 patients (30.6%) had bilateral hernias (26 left and 26 right), 22 were direct and 30 were indirect.

Of the 85 consecutive inguinal hernia repairs, 40 hernias (47.1%) were direct (medial), and 45 (52.9%) were indirect (lateral). We used the EHS hernia classification by Aechenu which is used during laparoscopic hernia operation.

EHS Classification for Inguinal Hernia

P = primary hernia

R = recurrent hernia

0 = no hernia detectable

1 = < 1.5 cm (one finger)

2 = < 3 cm (two fingers)

3 = > 3 cm (more than two fingers)

x = not investigated

L = lateral/ indirect hernia

M = medial/ direct hernia

F = Femoral hernia

(Table 1, Table 2)

There was no statistically significant difference in average mesh sensation between tacker-without fixation technique and glue-without fixation technique. Average mesh sensation was however higher in the tacker group compared to one with glue fixation.

TABLE 1.

DESCRIPTIVE STATISTICS

	Mean	range	SD
Age	52.4	(26-76 years)	(10.9)
Male	59		
Site of hernia			
Left	43.5%(37/85)		
Right	56.5%(48/85)		
Operative technique	TAPP		
EHS hernia classification			
Lateral	52.9%	(45/85)	
L1		(16/45)	
L2		(28/45)	
L3		(1/45)	
Medial	47.1%	(40/85)	
M1		(7/40)	
M2		(30/40)	
M3		(3/40)	
Postoperative cmplication	6 months	12 mounths	24 mounts
Seroma	1	0	0
Hematoma	2	0	0
Operative site infection	0	0	0
Recurrence	1	1	1

SD- standard deviation estimated from the range

TABLE 2.
RECURRENCE BASED ON FIXATION TECHNIQUE

		recurrence		Total
		Yes	No	
fixation	No fixation	1	27	28
	tacker	1	27	28
	glue	1	28	29
Total		3	82	85

In addition, our results showed that there was no difference between average sensitivity of mesh and average pain between the type of fixation when lying, sitting, bending, everyday activities, coughing or deep breathing, walking, standing, climbing up the stairs or exercising. Statistically significant difference was found in mesh when doing every day activities (p=0.021). The posthoc test showed that there was higher mesh sensitivity when using tacker mesh fixation when compared to fixation with mesh (p=0.022).

Comparison of pre-to postoperative pain

We compared the degree of pain pre and postoperatively at 3, 12 and 24 months. Our results showed that preoperative pain is correlated linearly to postoperative pain at 12 months (correlation coefficient 0.234, p=0.034) and at 24 months (correlation coefficient 0.227, p=0.227), however there is weak correlation. (Table 3)

We also assessed the correlation of postoperative pain to laterality of hernia occurrence-left to right.

There was no difference in pain at 12 months postoperatively between patients who had left hernia (p=0.069) or right hernia repair (p=0.179). This was consistent at 24 months respectively-left (p=0.071) and right (p=0.138). There was no statistical significant difference in average pain scores depending on laterality-left or right.

Post-operative complications

Two patients had a haematoma of the scrotum in the group A which was managed conservatively. This resolved spontaneously without any surgical treatment. There was one case of postoperative seroma, confirmed by ultrasound. Seroma was away from the mesh area. It did not require surgical intervention and was managed conservatively.

In the study there were three cases of hernia recurrence 3/85 (3.5%). One recurrence (EHS – L2) was found in group A 3 months postoperatively. The second recurrence (EHS – L3) was found group B at 15 months following the index surgery, and the third recurrence (EHS – M2) in group C 12 months postoperatively. All three recurrences were manged surgically using the classical Lichtenstein method of hernia repair. (Table 4)

TABLE 3.
CORRELATION MATRIX OF PAIN SENSATION

Correlation					
		Pain before operation	Pain afer 3 months	Pain afer 12 months	Pain afer 24 months
Pain before operation	Pearson Correlation	1	.191	.234*	.227*
	Sig. (2-tailed)		.080	.034	.041
	N	85	85	83	82
Pain afer 3 months	Pearson Correlation	.191	1	.204	.168
	Sig. (2-tailed)	.080		.064	.131
	N	85	85	83	82
Pain afer 12 months	Pearson Correlation	.234*	.204	1	.676
	Sig. (2-tailed)	.034	.064		.000
	N	83	83	83	82
Pain afer 24 months	Pearson Correlation	.227	.168	.676**	1
	Sig. (2-tailed)	.041	.131	.000	
	N	82	82	82	82

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 4.
THREE CASES OF HERNIA RECURRENCE

Recurrence				
	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	3	3,5	3,5	3,5
No	82	96,5	96,5	100,0
Total	85	100,0	100,0	

Discussion

Our study showed that there is no statistically significant difference in the recurrence of inguinal hernia between the tacker fixation, glue fixation and no mesh fixation. These results are comparable to the literature [3 – 5]. Similar to our results, the study by Kockerling et al. showed no increased risk of recurrence (p= 0.77) and reported on the safety of the no mesh fixation technique [3]. Some authors advocate the methodical fixation of the synthetic mesh as a valuable means to prevent hernia recurrence whereas others have reported no benefit of mesh fixation. TAPP mesh fixation with tackers can be omitted only up to a defect size of 3 cm, L3/M3 [18]. In our study we performed tacker mash fixation in all M3/L3 size hernias and 41 % of patients with hernia of size M2/L2 was fixated with tacks. Although we expected the pain to be higher in the group where the mesh was tacker-fixed, our

results failed to support this theory. Glue mesh fixation in laparoscopic inguinal hernia repair does not increase the risk for hernia recurrence and reduces the risk of developing chronic groin pain.

The difference between our study and the study of Sajid et al. [5] is that we used histoacryl glue, where they used fibrin glue. Similar to our study, Boldo et al. showed no difference in the post-operative chronic pain at 6 months though they reported higher rate of post-operative pain at 1 week (72.7 %) at the side of stapling and further 38 % at one month [9]. Further, the study by Kockerling et al. compared results of hernioplasty using tacker mesh fixation and fibrin glue technique [3].

For the purpose of our study we used CCS scale due to its specificity to hernia. It also determines both pain and mesh sensation. Other studies use the VAS scale. However despite being widely used, it only assesses the pain in single domain [3, 9].

Retrospective studies [15-16] reported low chronical pain with the use of glue fixation, however they used TEP technique instead of the TAPP approach in our study, therefore comparisons cannot be drawn. Studies [6-8] reported that the chronic pain can be dependent on the type of mesh used. Lightweight-macroporous mesh was associated with less chronical pain. Contrary to these results, Sajid et al. [20] reported no significant difference when using lightweight or heavyweight mesh. Our results showed that there is no significant difference between average mesh sensation, and the type of fixation during lying, sitting, bending, coughing, everyday activities, stairs climbing and exercises with the use of Proceed mesh [11]. In addition, there was no difference in pain scores pre-and postoperatively at 12 and 24 months between site of occurrence- left or right.

Conclusion

Our study showed no statistically significant difference in hernia recurrence rate between tacker mesh fixation, glue fixation or no mesh fixation for the surgical TAPP management of inguinal hernia. Higher rate of hernia recurrence was not observed in the fixation free group as long as peritoneal closure was performed. Site of mesh fixation seems important with regards to postoperative pain.

Conflict of interest

TGM declares no conflict of interest. MO declares no conflict of interest. GK declares no conflict of interest. IČ declares no conflict of interest. JP declares no conflict of interest.

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USPOREDBA DJELOTVORNOSTI METODA FIKSIRANJA MREŽICE KOPČAMA ILI LJEPILOM, I METODE BEZ FIKSACIJE TIJEKOM TRANSABDOMINALNE PREPERITONEALNE REPARACIJE INGVINALNE HERNIJE

S A Ž E T A K

Minimalno invazivne laparoskopske tehnike uključuju transabdominalnu preperitonealnu (TAPP) i totalnu ekstraperitonealnu hernioplastiku (TEP). U našem istraživanju uspoređujemo učestalost recidiva kile i kroničnu ingvinalnu bol nakon fiksacije mrežice pomoću histoakrilnog ljepila, fiksacije pomoću kopči te metode bez fiksacije tijekom TAPP postupka. Intenzitet postoperativne boli procijenjen je pomoću ljestvice *Carolinas Comfort* (CCS). U studiji se isključivo koristila mrežica *Proceed Surgical*. Uspoređene su tri skupine pacijenata: skupina (A) u kojoj je primijenjena fiksacija ljepilom, skupina (B) s fiksacijom resorbirajućim kopčama i skupina (C) bez fiksacije. U istraživanju je sudjelovalo 59 pacijenata muškog spola u dobi od 26 do 76 godina, koji su podvrgnuti hernioplastici primjenom TAPP tehnike. Ispitanici su bili podijeljeni u tri skupine: skupina (A) imala je 29 hernija, a skupine (B) i (C) imale su svaka 28 hernija. Sudionici studije praćeni su nakon 3, 12 i 24 mjeseca. Nije bilo statistički značajne razlike u recidivu između tri skupine. Ukupna stopa recidiva hernije bila je 3,5%. Jedan je zabilježen u skupini A 3 mjeseca poslije operacije. Drugi se pojavio u skupini B 15 mjeseci nakon operacije, a treći recidiv u skupini C dogodio se nakon 12 mjeseci. Dva bolesnika u skupini A imala su postoperativni hematom skrotuma, konzervativno liječen. Naše istraživanje je pokazalo da tip fiksacije mrežice ne povećava rizik od recidiva ingvinalne hernije ili kronične postoperativne boli.