Comparative study between the use of self-fixating mesh and non-self-fixating mesh in laparoscopic inguinal hernia repair transabdominal preperitoneal technique

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Background
Hernia is a common problem of the modern world with an incidence ranging from 5 to 7%. Of all groin hernias, around 75% are inguinal hernias. Recently with the advancement in laparoscopy, endoscopic repairs seem to offer better quality of life, decreasing hospital stay and early return to work.
Aim of the work
To compare between self-fixating mesh and fixation of non-self-fixating mesh with absorbable tacks in laparoscopic inguinal hernia repair transabdominal preperitoneal approach as regards intraoperative time, complications, postoperative pain, return to normal activity, and incidence of recurrence.
Patients and methods
Our study is a randomized, prospective study. It was conducted in El Demerdash, Ain Shams University Hospital on 30 patients with inguinal hernia who were operated upon between September 2018 and December 2018 with a minimal follow-up of 3 months.
Statistical analysis used
Data were collected, revised, coded, and entered to the Statistical Package for the Social Sciences (IBM SPSS), version 23. The quantitative data were presented as mean, SDs, and ranges when their distribution was found parametric. Also qualitative variables were presented as number and percentages
Results
Our study demonstrates that laparoscopic inguinal hernia repair using the transabdominal preperitoneal technique with implantation of a new Parietex ProGrip laparoscopic self-fixation mesh is a fast, effective, and reliable method in experienced hands, which combines the advantages of laparoscopic approach with simple and practical implantation of self-fixation mesh, which, according to our results, reduces the occurrence of chronic pain and the recurrence rate.
Conclusion
After this comparative study, both the use of self-gripping mesh and fixation of mesh by absorbable tacks approaches are similarly effective in terms of operative time, the incidence of recurrence, complications, and chronic pain coinciding with all the available literature.

Keywords:
laparoscopic inguinal hernia repair, transabdominal preperitoneal, self fixating mesh

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Introduction

Hernia is a common problem of the modern world with an incidence ranging from 5 to 7%. Of all groin hernias, around 75% are inguinal hernias [1].

In the early 1990s Arregui and Doin described the techniques of the laparoscopic inguinal hernioplasty including: transabdominal preperitoneal (TAPP) repair. Around the same time Phillips and McKernan described the totally extraperitoneal (TEP) technique of endoscopic hernioplasty. In both these repairs, the mesh in direct contact with the fascia of the transversalis muscle in the preperitoneal space allows tissue ingrowths leading to the fixation of the mesh [2].

The general indications for laparoscopic inguinal hernia repair as opposed to watchful waiting are the same as those for open inguinal hernia repair. Classically, the existence of an inguinal hernia has been considered sufficient reason for operative intervention [3].

Some reports have listed specific indications for laparoscopy over open repair, including recurrent hernias, bilateral hernias, and the need for earlier return to full activities [4].

Several studies have demonstrated salutary outcomes for laparoscopic repair of recurrent hernias [5].

In TAPP repair, titanium tacks also have traditionally been used to fix the mesh and can also be used to close the peritoneal flap. However, a 2011 report showed that acute pain was increased when more than 10 tacks were placed. A number of surgeons have now switched to using absorbable tacks to fix the mesh and close the peritoneum. Sutures or hernia stapling devices can also be used [6].

Some authors have advocated the use of fibrin glue to fixate the mesh [7].

Still other authors use no fixation at all but instead rely on peritoneal pressure to maintain the mesh in proper position [8].

Other surgeons use a self-fixating mesh (ProGrip mesh): Self-adhesive meshes are a relatively new advancement in inguinal hernia repair. They have been on the market since 2006 and have been used in both open and laparoscopic operations. Their use eliminates the complication risk, increased the operation time, and expense that come with the mechanical fixation of implanted mesh. The popularity and increased use of self-adhesive mesh have been attributed to the growing evidence of low rates of recurrence and postsurgical pain [9].

Aim of the work

This study aims to compare between self-fixating mesh and fixation of non-self-fixating mesh with absorbable tacks in laparoscopic inguinal hernia repair TAPP approach as regards the intraoperative time, complications, postoperative pain, return to normal activity, and incidence of recurrence.

Patients and methods

Patients

Our study is a randomized, prospective study. The study was conducted after the approval of the ethical committee of the surgical department, Ain Shams University. All the patients who participated in the study were informed about all the steps and signed the informed consent of the whole work. It was conducted in El Demerdash, Ain Shams University Hospital on 30 patients with inguinal hernia who were operated upon between September 2018 and December 2018 with a minimal follow-up of 3 months.

An informed consent was taken from all patients who accepted to participate in our study.

Inclusion criteria: inguinal hernia whether primary or recurrent:

(1) Reducible hernia.
(2) Indirect hernia or direct hernia.
(3) Unilateral or bilateral hernia.
(4) Male or female patient age 14–60 years.

Exclusion criteria

(1) Strangulated or obstructed hernia.
(2) Irreducible hernia.
(3) Concurrent femoral hernia.
(4) Patients who had a predisposing factor which was untreated as prostatic enlargement, chronic obstructive airway disease, chronic constipation or patients who could not withstand general anesthesia were also excluded from this study.
(5) Patients of age less than 14 or more than 60 years.
(6) Prior pelvic surgery or prostatectomy.
(7) Patients with bleeding tendency.

All patients in the study were under supervision of the same surgical team. The 30 patients were divided into two equal groups (15 each). Patient selection was randomized using the closed envelope method. Laparoscopic TAPP approach was offered to all patients.

Group A: 15 patients with inguinal hernia where a self-gripping mesh (SGM) (Parietex ProGrip Laparoscopic meshes) was used.

Group B: 15 patients with inguinal hernia where (12×15 cm) a prolene mesh was used and fixed with absorbable tacks.

Methods

The patients were subjected to the following.

Preoperative assessment

(1) Clinical history:
   (a) Personal history including age, occupation, and special habits of medical importance particularly smoking, complaint, and its duration.
   (b) History of present illness including complaint analysis; onset, duration, increasing and decreasing factors, and a review of other body systems especially chest complaints, bowel and urinary problems like constipation and prostatism.
   (c) Past history of medical issues, allergy to drugs, prior blood transfusion, and previous

operations done before, with special concern to complications of the hernia or prior attempts of treatment.
(d) Family history of inguinal hernia and other common diseases in the family.

(2) Clinical examination:
(a) General examination including vital data; examination of chest for signs of chronic obstructive lung disease; examination of the abdomen for abdominal masses, and digital rectal examination for enlargement of the prostate.
(b) Local examination of the inguinal region and scrotum to confirm the diagnosis of inguinal hernia and its type, and for the presence of complications.

Routine investigations: all patients were requested to undergo the routine investigations, including complete blood picture, coagulation profile, liver and kidney function tests, fasting blood sugar, chest radiograph and pelvi-abdominal ultrasound. Special investigations were requested for patients with specific problems such as pulmonary function tests for patients with manifestations of chronic obstructive airway disease; ECG for patients above the age of 40 years.

Intraoperative assessment

An infraumbilical incision was done, with placement of a 10–12 mm trocar, and the abdomen is insufflated. A10-mm 30° scope is then placed through the trocar, allowing viewing the peritoneal cavity. Two lateral trocars (5 and 12 mm) are placed at the level of the umbilicus and just lateral to the rectus at approximately the midclavicular line. After ports were placed, diagnostic laparoscopy of the whole abdomen was necessary to exclude other pathology or contraindications for surgery and for identifying hernia defects and to confirm whether they were direct or indirect defects.

We should identify the following key structures:

(1) Median and medial umbilical ligaments.
(2) Lateral umbilical ligament and epigastric vessels.
(3) Vas deferens and spermatic vessels.
(4) Iliac vessels.
(5) Hernia defect (direct or indirect).

After identification of the anatomy, we used laparoscopic scissors to raise the peritoneal flap extending between the anterior superior iliac spine and the medial umbilical ligament. Special attention was needed to keep the incision superior to the potential spaces for both direct and indirect hernia defects. We extended the peritoneal flap far enough the cephalad to ensure that it can cover the mesh completely and exclude it from the peritoneal cavity.

Before we dissect the hernia sac, the following structures should be identified:

(1) Pubic symphysis.
(2) Cooper's ligament.
(3) Iliopubic tract.

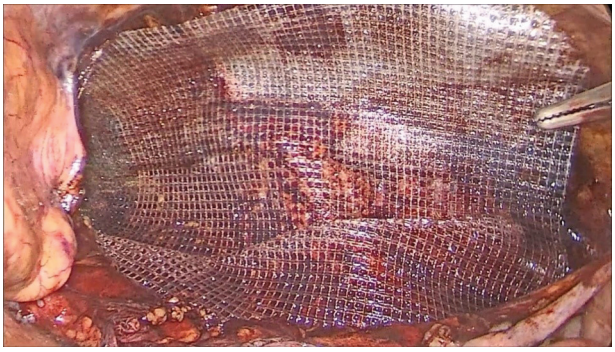
During dissection, care was taken to identify the triangle of doom, which contains the external iliac vessels and is bound medially by the vas deferens and laterally by the gonadal vessels. If the hernia sac was not reduced during the dissection of the peritoneal flap, it was usually reduced by applying gentle traction on the peritoneal attachments within the defect. In cases of long indirect sac, transection of the sac using electrocautery was applied.

In group A, after dissection and reduction of hernia, a SGM, self-fixating mesh (15×10 cm) was rolled on its transparency with the gripping surface facing the plastic. The mesh was then inserted into the abdomen easily through the infraumbilical trocar and driven to the preperitoneal site without adhering to the bowel loops. The upper part of the rolled mesh was fixed in place, then we unrolled the mesh that was spread in place to cover the whole dissected pocket (Fig. 1).

In group B, a 15×12 cm sheet of polypropylene mesh is introduced into the abdomen through the 10/12 mm umbilical trocar after being rolled into a tubular shape and then driven to the preperitoneal site, unrolled and spread with fixation by absorbable tacks (Fig. 2).

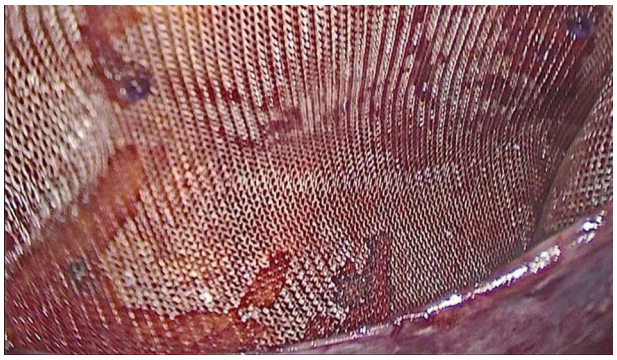
After the mesh was fit in place, the previously created peritoneal flap was lifted with graspers and sutured with Vicryl 2/0 in the two groups (Fig. 3).

Figure 1



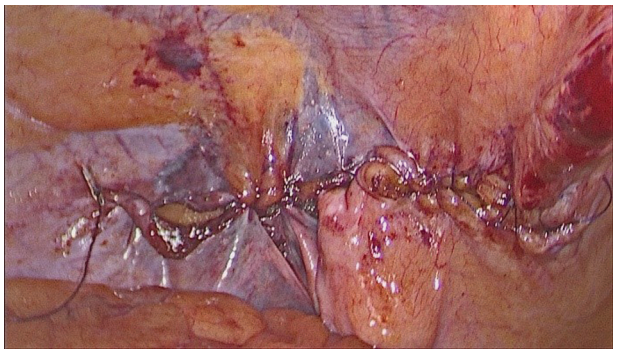
ProGrip mesh applied in the preperitoneal space.

Figure 2



Prolene mesh fixed in the preperitoneal space with absorbable tacks.

Figure 3



Peritoneal flap closed with Vicryl 2/0.

After peritoneal closure, the ports were removed under direct vision.

All skin incisions were then closed.

Assessment parameters

(1) Intraoperative parameters:
   (a) Operative time (min) was calculated from the induction of pneumoperitoneum till wound closure.
   (b) Intraoperative complications.
(2) Postoperative parameters (within the hospital stay):
   (a) Postoperative pain.
   (b) Postoperative complications (scrotal edema or hematoma).
   (c) Early ambulation.

All the patients were discharged on the next postoperative day and instructions were given to them including medication, wound dressing, and recommended activity profile.

Follow-up parameters

All patients were followed up at surgery outpatient clinic after 1 week, 1 month, and 3 months. However, all patients were instructed to seek our advice whenever they notice something abnormal.

During follow-up visits, the following were to be detected:

(1) Time of return of the patient to his work.
(2) Wound infection.
(3) Late postoperative complications (chronic pain was defined as the presence of inguinal or scrotal pain or pain in the midthigh area postoperatively, which lasts for more than 3 months, in accordance with the International Association for the Study of Pain recommendations with or without an alteration in sensitivity, as mentioned by the patient and by physical examination).
(4) Detection of recurrence and its type (recurrence was defined as a palpable hernia or a clear defect in the abdominal wall, which can be confirmed by an ultrasound).

Statistical analysis

Data were collected, revised, coded, and entered to the Statistical Package for the Social Sciences (IBM SPSS, Cairo, Egypt), version 23. The quantitative data were presented as mean, SDs, and ranges when their distribution was found parametric. Also qualitative variables were presented as number and percentages.

The comparison between groups with qualitative data were done by using the χ^2 test and Fisher's exact test instead of the χ^2 only when the expected count in any cell was found to be less than 5.

The comparison between two independent groups with quantitative data and parametric distribution was done by using the Independent t test while the comparison between the two paired groups with quantitative data and parametric distribution was done by using the paired t test.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the P value was considered significant as the following:

(1) P value more than 0.05: nonsignificant.
(2) P value less than 0.05: significant.
(3) P value less than 0.01: highly significant.

Results

Preoperative data

The age of the patients included in group A (SGM) ranged from 14 to 60 years, with a mean age of 38.43 ±14.25 years, while the age of the patients in group B (non-self-fixating mesh) ranged from 14 to 60 years, with a mean age of 40.20±12.63 years. As regards sex, there were only two female patients in group A, while the rest of all patients were men.

Intraoperative parameters

Operative time

The mean±SD operative time in group A is 64±20 min in unilateral cases, 120 min in bilateral, while in group B, it was 58±30 min in unilateral cases and 108 min in bilateral cases showing no statistical difference between the two groups as regards the length of the operation time.

Intraoperative complications

We had a single intraoperative complication represented as bleeding in group B. In this case, there was an injury to the inferior epigastric vessel and was managed by electrocautery to control the bleeding. There were no anesthesia-related complications or readmission.

The comparison between complications did not show any statistically significant differences between the two groups (Table 1).

Postoperative parameters

Postoperative pain evaluation

No significant postoperative pain was assessed except normal pain in the wound in group A, while in group B three (20%) patients had thigh and scrotal pain which improved after 2 months of follow-up; no statistical difference between the two groups was found during the 3 months of follow-up.

All the reported pain assessments had no effect on any patient's usual activity and did not require any therapy and no chronic postoperative pain of severe degree was reported (Table 2).

Early and late postoperative complications

Two of our total patients (13.3%) in group A suffered from postoperative wound infection and were managed by repeated dressing and good antibiotic coverage, while group B had no wound infection.

The incidence of mild and moderate chronic scrotal and thigh pain that improved after the 2-month follow-up was reported in the group B and no cases of chronic pain in group A, although the difference did not reach statistical significance (P=0.067).

Recurrence

No recurrent cases could be detected along the follow-up duration of 3 months.

Table 1 The difference between the operative time and intraoperative complications between the two groups

	Group A (N=15)	Group B (N=15)	Test value	P	Significance
Operative time for unilateral					
Mean±SD	64±20	58±30	0.645	0.524	NS
Range	45–90	44–90			
Operative time for bilateral					
Mean±SD	120.85±22.5	108.17±25.1	1.457	0.156	NS
Range	87–150	80–145			
Intraoperative complication [n (%)]					
None	15 (100)	14 (93.3)	1.034	0.309	NS
Bleeding	0 (0.0)	1 (6.7)			

Table 2 Comparison between both groups as regards postoperative pain

	Group A (N=15)	Group B (N=15)	Test value	P	Significance
Wound pain [n (%)]					
No	0 (0.0)	0 (0.0)	0.000	1.000	NS
Yes	15 (100)	15 (100)			
Scrotal and thigh pain [n (%)]					
No	15 (100)	12 (80)	3.333	0.067	NS
Yes	0 (0.0)	3 (20)			
Pain after 2 months [n (%)]					
No	15 (100)	15 (100)	0.000	1.000	NS
Yes	0 (0.0)	0 (0.0)			

No statistical significance could be detected as the *P* value of 1 as regards the recurrence rate (Table 3).

(1) Postoperative hospital stay: all patients were discharged on the second day postoperatively. The mean postoperative hospital stay was 1.5 ±0.5 and 1.6±0.3 days for groups A and B, respectively. This difference was not significant (*P*=0.512).
(2) Return to normal activity.

The mean time to return to normal daily activities after surgery was 7±2 versus 8±2 days in group A and group B, respectively. This difference was not statistically significant (*P*=0.182).

Table 4

Discussion

The choice of an appropriate surgical approach is difficult in the treatment of inguinal hernia [10].

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

A recent meta-analysis comparing between the laparoscopic repair versus open Liechtenstein 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 [10].

The longstanding standard practice for TAPP was to use mesh fixation with tackers to prevent recurrence but atraumatic mesh fixation methods are being increasingly used to prevent chronic pain in the wake of traumatic fixation methods [12].

The current surgical options for mesh fixation include sutures, tacks or staples, self-fixing meshes and fibrin or other glues. However, there is no consensus on the best surgical technique and the choice of options often depends on surgeons' personal preference [13].

Self-adhesive meshes are a relatively new advancement in inguinal hernia repair; they have been used in both open and laparoscopic operations reducing the complication risk as lower rates of recurrence and postsurgical pain, also shorten operation time, and lowers the expense that come with the mechanical fixation of the implanted mesh [14].

Owing the shape of its absorbable part, this SGM adheres to the tissues without the need for other fixation systems. Once this component of the mesh is absorbed, only the macroporous part, made of polyester, remains at the site; therefore, it is an ideal mesh for use during laparoscopic repair of inguinal hernias [15].

Table 3 Summary of the postoperative complications and recurrence occurrence among the two groups

	Group A (*N*=15)	Group B (*N*=15)	Test value	*P*	Significance
Recurrence [*n* (%)]					
No	15 (100.0)	15 (100.0)	0.000	1.000	NS
Yes	0 (0.0)	0 (0.0)			
Pain [*n* (%)]					
No	15 (100)	12 (80.0)	3.333	0.067	NS
Yes	0 (0)	3 (20.0)			
Postoperative complication [*n* (%)]					
No	13 (86.7)	15 (100)	2.143	0.143	NS
Wound infection	2 (13.3)	0 (0)			

Table 4 Statistical values as regards the difference between the two study groups

	Group A (*N*=15)	Group B (*N*=15)	Test value	*P*	Significance
Postoperative hospital stay in days					
Mean±SD	1.5±0.5	1.6±0.3	0.664	0.512	NS
Range	1–2	1–2			
Return to normal activity (days)					
Mean±SD	7.0±2.0	8.0±2.0	1.369	0.182	NS
Range	5–14	5–14			

This study was conducted to compare laparoscopic inguinal hernia repair with SGM fixation or with mesh fixation by absorbable tacks from different points of view including operation duration, postoperative pain that was assessed using the patient-dependent visual analog score, postoperative complications, postoperative hospital stay, time needed to return to normal activity, and most importantly the recurrence.

We wanted also to present our experience in using this novel method of fixation and evaluate early outcomes of patients who had undergone TAPP inguinal hernia repair with SGMs.

The study enrolled 30 patients with inguinal hernia who underwent laparoscopic TAPP inguinal hernia repair for 6 months (from September 2018 till March 2019), and the patients were divided into two groups:

Group A: 15 patients with inguinal hernia who were operated upon by TAPP laparoscopic inguinal hernia repair with fixation using a SGM (Parietex ProGrip laparoscopic meshes).

Group B: 15 patients with inguinal hernia who were operated upon by TAPP laparoscopic inguinal hernia repair with (10×15 cm) prolene mesh with fixation by absorbable tacks.

The allocation of the patients in either group was made on the operation day by the closed envelope method.

The patients were seen at the outpatient clinic for following up the recurrence rate in both groups after 1 week, 1 month, and 3 months by adequate history and physical examination.

None of the patients recruited into the study was excluded, withdrew from or died during the course of the trial, and thus all patients were included in the analysis.

Patients in both groups were similar with respect to age; the patients ages ranged from 14 to 60 years, most of them were male patients with a male to female ratio (28/2) with the two female patients in group A having no significant difference between both groups as regards sex with a mean age of 40 years in both groups. This age of presentation is noticed to be earlier than various studies assessing the SGM as in a recent study conducted by Birk *et al.* [9]. More than 220 hernias with a mean follow-up at 23 months in Germany, the mean age of the studied population was 54 years, the younger age of presentation in our study is surely explained by the heavy occupational nature of most of the studied cases adding to the value of our study in evaluating the procedure in different age groups.

The same age group was observed in an Indian study recently which studied the inguinal hernia risk factors. It stated that the age range of the most common patients who suffered from inguinal hernia ranged from 46 to 60 years [16].

Most of the studied patients were men to match the male predominance as regards the patient's flow for recruitments and this predominance of hernia in men 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 sexes [17].

The mean operative time in the SGM group was 64 ±20 min for unilateral cases and 120 min for bilateral and this is very close to the operation time taken during a prospective randomized trial conducted by the University of Turin in Italy which assessed the SGM in laparoscopic inguinal hernia repair in young and elderly patients as their operation time ranged from 74.4±12.8 min [18].

The same operation time was taken in a study which included 96 patients comparing in a prospective manner between SGM versus staple fixation in laparoscopic inguinal hernia where the mean duration of the procedures was 83 min in the SGM group [15].

No significant difference was found between the operation time length needed to apply ProGrip mesh versus mesh fixation with tacks approach. However, the SGM needed some experience to place it correctly as it adheres easily with the surrounding structures and this handling improved with time and that is why the operative time was relatively longer in group A.

In our study, there were no cases of severe chronic pain in the SGM group, similarly Ferrarese *et al.* [18] also had the same finding on the assessment of chronic pain, after TAPP surgical repair with SGM over 142 patients.

Only 20% of cases suffered from mild thigh and scrotal pain in the non-self-fixating group which improved

after 2 months. We believe that pain was attributed to mild neuritis because of the application of tacks nearby the neurovascular structures. No serious adverse event was reported.

SGM has the advantage of atraumatic fixation which is associated with reduced risk of neurovascular injury or chronic postoperative pain and consequent earlier resumption of physical and social activities.

That finding coincides with most of the prospective studies which assessed the SGM in terms of postoperative and chronic pain, as in a German study; 169 male and female patients with 220 primary inguinal hernias had surgical repair by the laparoscopic TAPP approach using Parietex ProGrip meshes with 23 months' follow-up, where the majority of patients had no pain and only mild pain was experienced by 3.6% of patients, and 1.2% of patients experienced severe pain confirming that ProGrip SGMs are rapid, efficient, and safe resulting in a very low incidence of chronic groin pain [9].

In our study, a high percentage of people had a full return to a normal physical activity with no significant limitations as similarly resulted in an Italian study which assessed the SGM as a novel method of fixation with TAPP surgical approach among 100 patients [19].

Our mean time to return to normal daily activities after surgery ranged between 7 and 8 days in both groups, similarly noticed in a prospective study on 29 patients who had a TAPP repair with a ProGrip mesh as their mean time to full activity return was 8.4 days [20].

Even though fixation of the mesh might have an impact on recurrence rates, surgical site infections, postoperative chronic pain or quality of life, no accepted gold standard exists on whether, when, and how to fixate the mesh [21].

In the 'guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia' of the International Endohernia Society, it is stated that only one study compared fixation versus nonfixation in TAPP repair and found no significant differences in the incidence of recurrence between fixated and nonfixated repairs [22].

Then the International Endohernia Society updated its guidelines for TEP and TAPP hernia repair in 2015 and concluded 'in case of TAPP repair nonfixation should be considered in types LI, II, and MI, II hernias (EHS classification)' (grade B recommendation) [23].

Another recent analysis compared the recurrence rates on 1-year follow-up in respect of mesh fixation versus nonfixation in TAPP. Univariable analysis did not find any significant difference between these two parameters, confirming that mesh fixation did not have any relevant impact on the recurrence rate regardless of the defect size [12].

In a meta-analysis examining the use of tacker fixation versus no fixation of mesh in laparoscopic inguinal hernia repair conducted by Sajid *et al.* [24] concluded that 'nonmesh fixation in laparoscopic inguinal hernia repair does not increase the risk of hernia recurrence' and stated 'based upon the results of this review nonmesh fixation approach may be adopted routinely and safely in laparoscopic inguinal hernia repair.'

Also according to Amirzargar *et al.* [25] who conducted a study in 2013 comparing mesh fixation with nonfixation in TAPP repair stating that 'laparoscopic TAPP inguinal hernia repair without mesh fixation is safe and feasible with no increase in recurrence rate. In addition, it offers a significantly shorter operation time than TAPP mesh fixation.'

Our data agreed with all that previously mentioned literature, no difference in terms of recurrence was detected between SGM fixation versus mesh fixation by absorbable tacks adding ProGrip mesh evaluation as an efficient novel method of fixation with the advantage of its atraumatic approach if compared with other fixation methods.

Studies have shown that nonfixation hernia repair is generally more cost-effective than repair with mesh fixation [26].

However, the use of a SGM avoids the cost of a fixation device (instrument or fibrin glue), therefore, decreasing the overall cost of the TAPP procedure.

As confirmed by Fumagalli Romario *et al.* [15], the cost of the material used for the SGM procedure was lower than the cost of the material for staples, making it also cost-effective and weighs in favor of SGM.

Our study demonstrates that laparoscopic inguinal hernia repair using the TAPP technique with implantation of a new Parietex ProGrip laparoscopic self-fixation mesh is a fast, effective, and reliable

method in experienced hands, which combines the advantages of laparoscopic approach with simple and practical implantation of self-fixation mesh, which, according to our results, reduces the occurrence of chronic pain and the recurrence rate.

The current study has some limitations 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 numbers of study population.

Also, most of the patients are men, but since it is reasonable to assume that hernia types in women are similar, and possibly also easier to repair, women might also benefit from this type of procedure, provided there are no copathologies that are contraindications for laparoscopic surgery.

The average follow-up of the patients was just 3 months which is reasonable for detecting early recurrences as an evaluation of both laparoscopic methods. However, more time is required for longer follow-up of the patients to detect late recurrences (which is more relevant) and to conclude the outcome of both approaches.

Conclusion

In conclusion, both the use of SGM and fixation of mesh by absorbable tacks approaches are similarly effective in terms of operative time, the incidence of recurrence, complications, and chronic pain coinciding with all the available literature. However, further research is recommended for a longer period of time and a bigger sample size in order to generalize the results.

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Conflicts of interest

There are no conflicts of interest.

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