

Commencing Mesh Fixation with Sutures versus Non-Fixation Technique in Laparoscopic Transabdominal Preperitoneal Inguinal Hernia Repair

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Background: Laparoscopic inguinal hernial repair, including the “transabdominal preperitoneal repair” (TAPP), has become popular in Egypt. Nonetheless, mesh fixation during that procedure has been questioned. Some surgeons believe that the fixation step is essential to prevent mesh migration and recurrence, whereas others believe that fixation carries more risk of chronic postoperative pain. Herein, we compared the outcomes of mesh fixation versus non-fixation in such cases.

Patients and methods: Forty patients scheduled for TAPP were enrolled in our randomized prospective trial. Two approaches were used: mesh fixation (20 patients) and non-fixation (20 patients). The main outcome was the operative duration, whereas secondary ones included early and late postoperative adverse events (within a one-year follow-up).

Results: We noted no notable differences regarding patient and hernia parameters when comparing the two groups. When mesh fixation was omitted, the operative time significantly decreased (45 vs. 80 minutes in the other group – $p = 0.002$). No patients developed wound infection, testicular atrophy, or postoperative recurrence during the one-year follow-up. The occurrence of seroma and hematoma was similar in statistical terms across both groups. Nonetheless, mesh fixation yielded a significant rise ($p = 0.035$) in chronic postoperative inguinodynia (20%) while not encountered in the other group (0%). That made patient satisfaction better in the non-fixation group ($p = 0.040$).

Conclusion: Omitting mesh fixation during the TAPP procedure does not add significant risks to the perioperative and one-year outcomes. Contrarily, it yielded significant benefits, including shorter operative time, less incidence of inguinodynia, and better satisfaction.

Key words: Inguinal hernia, TAPP, Mesh fixation, Non-fixation.

Introduction

Inguinal hernia is defined as the protrusion of one or more intra-abdominal contents through a weak area in the groin region. That protrusion could occur through the posterior wall of the inguinal canal, making the hernia direct in nature, while it can pass through the internal ring in indirect lesions.¹ According to a previous Epidemiological study, inguinal hernia was the most common abdominal wall hernia, as it attributed to 56% of the study cases.²

Based on international guidelines, surgical tension-free repair is the main management option for symptomatic cases. The availability of inguinal hernia patients makes its repair procedure a common operation in general surgical practice.^{3,4} That repair could be achieved via the invasive (Open) approach, termed Lichtenstein repair, or the minimally invasive approach (Laparoscopy).^{5,6} The latter included “transabdominal preperitoneal repair” and “totally extraperitoneal repair” (Summarized as TAPP and TEPP, respectively).^{6,7}

Despite almost equal outcomes regarding postoperative recurrence between the open and laparoscopic repair options, the latter are always preferred as they yield a better recovery profile

(Less pain and earlier return to daily activities).⁸

During the laparoscopic repair procedures, the mesh is secured over the hernial defect using tacks or sutures. Theoretically, this could help prevent mesh migration and decrease postoperative recurrence.^{8,9} Nonetheless, the fixation process may induce nearby nerve irritation or entrapment, leading to distressing chronic postoperative inguinodynia.⁹⁻¹¹

To solve the previous dilemma of whether to use or omit mesh fixation, we conducted the present trial to compare mesh fixation versus non-fixation in inguinal hernia patients subjected to the TAPP procedure.

Patients and methods

This was a prospective trial that was performed at the general surgery departments of both Almaza and Kobri Elkoba Military Hospitals, Cairo. The study was conducted over an 18-month period, from June 2022 to December 2023. We enrolled adult patients diagnosed with unilateral or bilateral inguinal hernia, scheduled for TAPP, and admitted during the initial six months of the previously mentioned period.

Patients with the previous criteria were clinically, radiologically, and biochemically assessed prior to the procedure. History taking focused on

demographic parameters, duration of hernia, and associated symptoms (Chronic chest or urinary symptoms), while clinical examination focused on abdominal examination (To assess hernia side and associated abdominal findings). Biochemical work-up included routine preoperative investigations, whereas radiological assessment was done by transabdominal ultrasound to exclude any intra-abdominal pathological space-occupying lesion.

Patients with previous hernia repair, other hernial orifices (Umbilical, femoral, Spigelian, or others), and complicated hernias (Irreducible, incarcerated, obstructed, or strangulated lesions) were excluded from the study. The patients were also examined by the anesthetic team, and their physical status was classified according to the "American Society of Anesthesiologists" (ASA) classification.¹² We excluded patients whose class was three or more.

Forty patients were found eligible for our enrollment criteria. All of them were informed about the study perspective, advantages, and possible complications of each approach. Their approval was documented in a written consent form, which was signed by the patient himself/herself. The study protocol was also approved by the ethical board of both hospitals.

On the surgery day, the patients were divided into two groups: the mesh fixation group had their mesh fixed with sutures during the TAPP procedure, and the non-fixation group had the same procedure, but the fixation step was omitted. The group allocation was done via the "sealed envelope method," which

made our study randomized in nature.

The TAPP procedure was performed under general anesthesia when the patient was in the Trendelenburg position. Abdominal insufflation was achieved via the Veress needle, followed by the insertion of the camera port in the midline just below the umbilicus. The two working ports were inserted at both sides at the right and left midclavicular lines. The operation started by dissecting the peritoneum three centimeters superior to the hernia defect, and a preperitoneal pocket was created to properly expose the symphysis pubis, the spermatic cord with its contents, and the triangle of Hasselbach. Care was taken to preserve the inferior epigastric vessels.

The hernial sac was dissected from the fascia transversalis and the hernial defect. In patients with indirect hernias, the sac was freely dissected from the cord contents (Or the uterine round ligament) and reduced back to the abdomen. Then, a large non-absorbable prolene mesh (10 x 15 cm) was inserted through the camera port, and it was inserted in the created preperitoneal pocket to achieve sufficient coverage for internal and femoral rings together with the Hasselbach triangle. In the mesh fixation group, the mesh was fixed to the rectus muscle, the conjoint tendon, and the pectineal ligament. Sutures were used for the fixation process (prolene 2/0 sutures). We took care to avoid the triangles of pain and danger along with the corona mortis when the sutures were applied (**Fig. 1**).

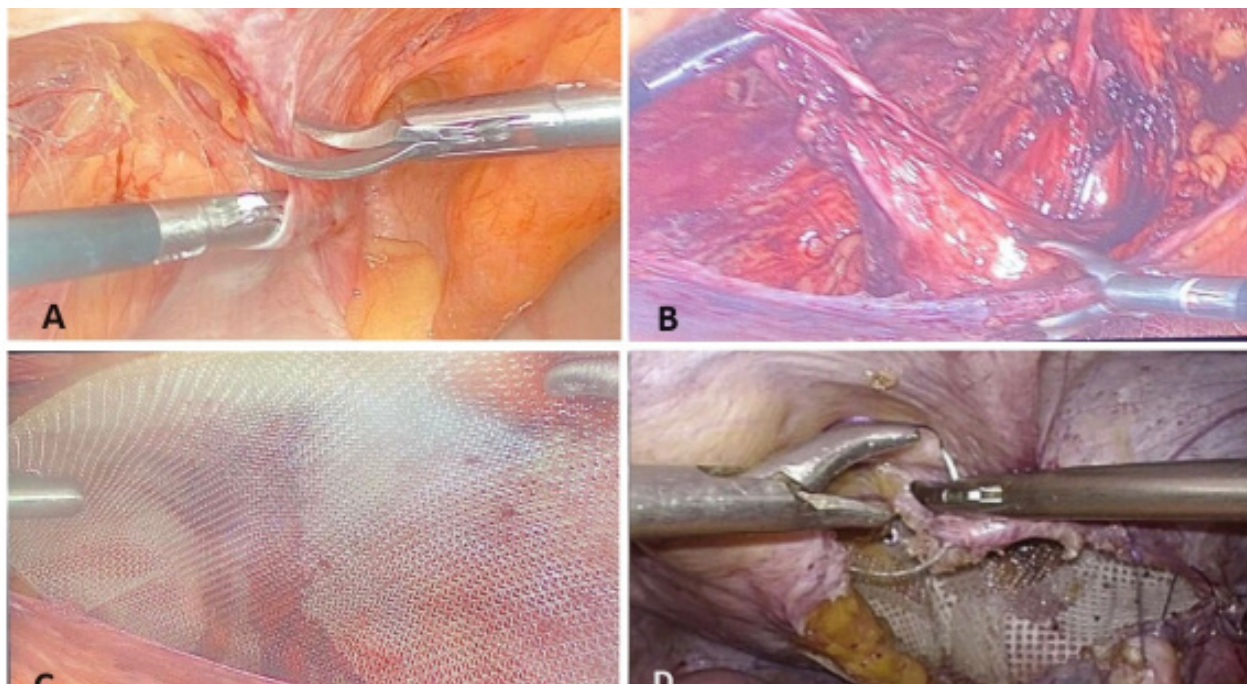


Fig 1: (A) Opening of peritoneal fold. (B) Dissection of hernial sac from the cord. (C) Putting the mesh without fixation. (D) Closure of peritoneum over the mesh.

The fixation process was omitted in the non-fixation group. In both groups, the peritoneal opening was closed by absorbable (Vicryl 2/0) sutures, followed by deflation of the abdomen and port extraction. The ports were closed by prolene 2/0 sutures. Any intraoperative complications were recorded along with the duration of the procedure.

Postoperatively, the patients were allowed to start oral fluid intake within six hours after the procedure. Their pain was controlled by IV paracetamol (1 gm/ 8 hours) and IV ibuprofen (800 mg/ 8 hours). All patients were discharged on the first postoperative day. They were commenced on oral analgesics and scrotal support was recommended for one week after the procedure. They were asked to return after two weeks for stitch removal.

Any early adverse events (Infection, seroma, or hematoma) were noted and recorded. The patients were asked to return to our outpatient clinic on monthly basis, Also the instructions were clarified to them to reschedule an early appointment (48 Hours) if they developed any late complications (Chronic inguinodynia, testicular atrophy, or recurrence) one year after the procedure. Seroma was defined as the collection of serous fluid related to the operative site,¹³ whereas chronic inguinodynia was defined as pain lasting at least three months after the procedure.¹⁴ Hernia recurrence was established when there was a clinically palpable defect or a swelling related to the previous repair, detected by two surgeons.¹⁵ At the one-year follow-up, no patients were lost in the follow up schedule and patient satisfaction with the TAPP procedure was classified based on a three-grade Likert scale: satisfied, neutral, or dissatisfied.¹⁶

Study outcomes

The recorded operative time in the two groups was our main outcome, whereas secondary ones included early and late postoperative adverse events.

Sample size estimation

Our sample size was estimated via the "SPSS Sample Power" software (Version 3.0.1). We depended on the findings previously reported by Li et al., keeping in mind that the operative time is the main outcome. The previous researchers reported that the operative time was 60.5 ± 12.2 minutes when mesh fixation was used and 50.1 ± 10.3 minutes when mesh fixation was omitted. The difference between the two groups was taken to estimate the proper sample size, which was 18 patients in each group (To achieve 80% study power and 0.05 significance level). That number was increased to

20 cases (10% increase) in each group to avoid possible dropouts during the follow-up.

Statistical analysis

The SPSS software was used to compare between our two groups. The following tests were applied according to the parameters compared: The Chi-square test (For frequencies), the Mann-Whitney test (For medians), and the student-t test (For means). Any obtained p-value was considered significant when it was less than 0.05 (Marked with * in the following tables in the results section).

Results

Table 1 shows the basic demographic parameters of the study cases, and the comparison between the two groups did not yield any notable statistical differences. Also, the physical status was comparable between the two groups ($P = 0.752$).

Most patients had a unilateral hernia in both groups (75% of the fixation cases and 85% of the non-fixation cases), while the remaining ones had bilateral lesions. The duration of the hernias had a median value of four years in both groups (**Table 2**). The previous hernia characteristics did not differ between our groups.

When mesh fixation was omitted, the operative time significantly decreased (45 vs. 80 minutes in the fixation group – $p = 0.002$). No intraoperative adverse events were encountered in our study (Organ or vascular injury) (**Table 3**).

All patients in both groups were discharged on the first postoperative day. No patients developed port site infection. The incidence of other early postoperative adverse events did not express notable differences. Only one patient developed a hematoma in the fixation group (5%), and it was managed by topical r-hirudin 420 I.U. with progressive resolution and no need for drainage. One patient in each group developed postoperative seroma, which resolved spontaneously with time with no need for needle aspiration (**Table 4**).

No patients had testicular atrophy or hernia recurrence at the one-year follow-up visit. Mesh fixation led to a significant rise in the incidence of chronic inguinodynia (20%), which was never reported in the non-fixation group ($P=0.035$). Table 5 shows the previous data.

As illustrated in Table 6, patient satisfaction was significantly better in the non-fixation group ($P=0.040$). Chronic inguinodynia was the main cause of dissatisfaction in the fixation group.

Table 1: Basic demographic parameters

	Mesh fixation (n = 20)	Non-Fixation (n = 20)	P-value
Age (years)	41.35 ± 11.10	40.00 ± 10.39	0.694
Gender			
Male	20 (100%)	19 (95%)	0.311
Female	0 (0%)	1 (5%)	
BMI (kg/m ²)	31.28 ± 10.23	28.43 ± 3.97	0.251
ASA class			
I	10 (50%)	11 (55%)	0.752
II	10 (50%)	9 (45%)	

Table 2: Hernia characteristics

	Mesh fixation (N = 20)	Non-Fixation (N = 20)	P-value
Side			
Unilateral	15 (75%)	17 (85%)	0.429
Bilateral	5 (25%)	3 (15%)	
Duration (Years)	4 (1 – 8)	4 (1 – 7)	0.250

Table 3: Intraoperative parameters

	Mesh fixation (n = 20)	Non-Fixation (n = 20)	P-value
Operative time (Minutes)	45 (40 – 110)	80 (70 – 170)	0.002*
Intraoperative complications	0 (0%)	0 (0%)	_____

Table 4: Hospitalization period and early postoperative complications

	Mesh fixation (n = 20)	Non-Fixation (n = 20)	P-value
Hospital stay (Days)	1 (1 – 2)	1 (1 – 2)	0.294
Wound infection	0 (0%)	0 (0%)	_____
Hematoma	1 (5%)	0 (0%)	0.311
Seroma	1 (5%)	1 (5%)	1

Table 5: Delayed postoperative complications

	Mesh fixation (n = 20)	Non-Fixation (n = 20)	P-value
Testicular atrophy	0 (0%)	0 (0%)	_____
Chronic Inguinodynia	4 (20%)	0 (0%)	0.035*
One-year recurrence	0 (0%)	0 (0%)	_____

Table 6: Patient satisfaction

	Mesh fixation (n = 20)	Non-Fixation (n = 20)	P-value
Satisfaction level			
Satisfied	13 (65%)	19 (95%)	0.040*
Neutral	2 (10%)	1 (5%)	
Dissatisfied	5 (25%)	0 (0%)	

Discussion

The current trial was performed to elucidate if mesh fixation is crucial for the success of the TAPP procedure. We compared one-year outcome as well as early post-operative complications between fixation versus non-fixation in inguinal hernia patients. One could notice that all preoperative variables had no notable differences between both groups, which confirms the reliability of our randomization. That should also decrease the bias risk and enhance the integrity of our findings.

Firstly, we should highlight that we have applied hand-taken sutures rather than tacks, although the latter is more rapid and saves more operative time. That is because some Egyptian hospitals do not have the tacks because of their high financial costs compared to the sutures.¹⁷ The availability of such expensive materials would be problematic in many developing countries.

In our study, we noted that omitting suture fixation led to a significant decline in the operative time, and that could be considered another cost benefit advantage of that approach. It is reasonable that taking the intracorporeal sutures would take much more operative time than when omitted in the other group. Our findings were previously confirmed by Li et al., who reported a mean operative time of 60.5 ± 12.2 minutes in the fixation group compared to 50.1 ± 10.3 minutes in the non-fixation cases ($P = 0.02$).¹¹ Wang et al. had similar outcomes regarding the operative time.¹⁸ Furthermore, Habeeb et al. reported that the TAPP procedures lasting for < 60 minutes had a prevalence of 91% in the non-fixation group, compared to 63.2% in the fixation group, even though these authors used tacks for fixation rather than sutures ($p < 0.001$).⁹

No patients developed port site infection in our study, and that is identical to the findings of Li et al.¹¹

Postoperative hematoma occurred in only one patient in the fixation group (5%). Chamatal and Keil reported that the previous adverse event could be encountered in 3 – 8% of cases after the same procedure.¹⁹ A previous study also reported no notable statistical difference between the fixation and non-fixation groups regarding the incidence of post-TAPP hematoma ($p = 0.78$).²⁰

Our incidence of seroma in both groups was 5%, which coincides with the literature that reported a range between 3% and 16% for the same adverse event following the TAPP procedure.^{21,22} Kalidarej et al. reported the incidence of the same complication in 7.3% of cases in the fixation group and 5.1% of cases in the non-fixation group ($p = 0.524$),²³ which is near our findings.

We did not encounter any patients with testicular atrophy. Although it may occur after inguinal hernioplasty, it is still a rare complication, and it occurs due to testicular artery ligation or injury in the preperitoneal space,^{24,25} secondary to extensive sac dissection from the cord.²⁵ As the TAPP procedure entails minimal cord dissection, it is expected to have a low risk of complications after such a procedure.⁹

Our findings revealed that omitting mesh fixation was protective against the incidence of chronic inguinodynia (20% in the fixation group vs. no cases in the other group), although we avoided taking sutures in the pian triangle during the procedure. The pathogenesis of postoperative chronic inguinodynia is complex as many factors are incriminated, including nerve injury by mesh fixation, nerve entrapment by the mesh itself, scar tissue formation, and mesh-related inflammation.^{11,18,26} Our incidence of chronic pain lies within the reported range of that stressful adverse event, which lies between 1% and 20% after laparoscopic inguinal hernioplasty.²⁷⁻²⁹

Habeeb et al. agreed with us, as mesh fixation led to a 19.9% incidence rate of chronic pain compared to 1.9% in the non-fixation group ($p < 0.001$).⁹ In the same context, Li et al. reported that three- and six-month pain scores at the region of hernia repair were significantly lower in the non-fixation group ($p = 0.01$ and < 0.01 , respectively). They explained their finding by the fact that skipping the fixation step will avoid injury to the nearby neurovascular structures, which should decrease the incidence of that complication.¹¹ Yazd et al. reported similar outcomes.³⁰

We did not encounter any recurrent cases during the scheduled follow-up visits, and that agrees with Ferzli et al., who also denied the incidence of recurrence in their two groups after one year. Li and his colleagues also reported a 0% recurrence rate in the fixation and non-fixation groups after mean follow-up periods of 11.2 and 11.5 months, respectively.¹¹ After a two-year follow-up period, Azevedo et al. reported no recurrences in their fixation and non-fixation groups.⁸

Our trial has certain drawbacks. We included a small set of cases that were followed up for only a one-year period. The upcoming studies should cover the previous missing perspectives.

Conclusion

Omitting mesh fixation during the TAPP procedure does not add significant risks to the perioperative and one-year outcomes. Nonetheless, it yields shorter operative time and less incidence of chronic inguinodynia, making it preferable over mesh fixation.

Conflict of interest: Nil.

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