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Mesh Fixation Versus non Fixation in Laparoscopic Trans Abdominal Preperitoneal Repair of Inguinal Hernia, A Comparative Study

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Abstract

The purpose of this study is making a comparison between the outcome of fixation und non fixation in the laparoscopically repair of inguinal hernia.Two major complications with laparoscopic inguinal hernia (IH) repair are recurrences and chronic groin pain (CGP). The procedure involves fixing the mesh with the tackers which is believed to increase the rate of CGP due to nerve injuries. Thus, non-fixation of mesh is considered to decrease but regarding increased recurrences. In this Retrospective study of database of 50 repairs was done on 50 patients (fixation 25 and non-fixation 25) during a period of 1 years with minimum of 6 months of clinical follow-up. The primary objective was to assess the recurrence rates and CGP and the secondary objective was to assess operative times, post-op pain, duration of hospital stay, and cost.There is slight increase in (operative time, hospital stay and post-operative complication) in fixation method more than non-fixation .Non-fixation of mesh in (TAPP) does not lead to increased recurrence but decreased costs.There is significant difference between mesh fixation and non-fixation as regard to operation time, cost and hospital stay.

Keywords: Inguinal hernia, Laparoscopic repair, Trans Abdominal Preperitonial repair, Non-fixation of mesh , Recurrence rates, Chronic groin pain.

1. Introduction

Laparoscopic approach to inguinal hernia surgery started in the 1980s. Since then, many techniques of laparoscopic inguinal hernia repair had been developed. Today, only two techniques are commonly employed—totally extra peritoneal repair (TEP) and the transabdominal preperitoneal repair (TAPP) [2, 3]. TAPP has emerged as the favored technique [4].

The recurrence is considered to be the major complication with hernia repair, attention is drawn to other complications like chronic groin pain (CGP) and quality of life (QOL) [5, 6].The incidence of CGP groin following laparoscopic IH surgery has been reported between 0.03 and 31% [7, 8].

CGP singularly affects the quality of life in patients undergoing laparoscopic IH surgery and remains a key area for surgeons to improve upon. CGP most often occurs due to nerve damage during LIHS which can be caused during dissection or fixation of mesh. Mesh fixation is usually done by laparoscopic tackers and multiple tacks were being used. Subsequently, in an attempt to reduce CGP, the number of tacks has now been reduce to two, one medially over the coopers ligament and another laterally at the level of anterior superior iliac spine [9]. Further, there have been attempts to completely avoid fixation of mesh. The concerns in avoiding mesh fixation are that in an attempt to reduce CGP and decrease both cost and duration of operation. Three meta-analyses have shown that non-fixation of mesh does not lead to increased recurrences [10-12].

2. Patients and methods

This is a retrospective randomized controlled study of database of all patients undergoing TAPP for laparoscopic IH at Benha University from February 2018 to June 2019. All patients completed a minimum of 6 months follow-up.

The aim of this study is to evaluate the outcomes of mesh fixation versus non-fixation in TAPP with a primary objective to evaluate the recurrence rates and chronic groin pain and secondary objective to assess the operative times, post-op pain, duration of hospital stay, days taken to return to activity, and cost.

Inclusion criteria

all adult male patients (more than 18 years) fit for pneumoperitonium. The procedure was done under general anesthesia with urinary bladder catheterization.

Exclusion criteria

Female patients or male patients unfit for surgery or pneumoperitoneum.

2.1 Operative technique of Laparoscopic TAPP repairs

Preparation

1. Insert a urinary catheter before TAPP procedure.
2. Abdominal and groin hair was shaved from costal margin to midthigh.
3. Prophylactic antibiotic one gram a first-generation cephalosporin was given at induction of anesthesia.

Positioning and scrubbing:

The patient is placed in the supine position on the operating table; the arms are positioned at the patient's side to facilitate access. After administration of general anesthetic, a routine scrubbing is performed to include the entire

abdominal wall, the upper thighs, penis and scrotum.

Laparoscopic access

The patient is placed in a Trendelenburg position at 25-50 to allow the small intestine to move cephalad, to permit the hernial orifice and lower abdominal wall to be easily visualized. A 10mm skin incision is made just above the umbilicus after the incision is made; the fat is carefully spread with a clamp to avoid bleeding from small vessels that would obscure identification of the anterior rectus sheath. Two S-retractors are placed in the wound and used as dissectors to expose the white fibers of the fascia. The fascia is incised and elevated with clamps and the mid line is exposed and the linea Alba is catched up and incised and the port trocar is inserted. The insufflator is connected, initial flow is less than 2 liters/min and intraperitoneal pressure readings should be less than 7mmHg. The peritoneal cavity is then filled with carbon dioxide (CO_2) to a maximum pressure of 15mmHg. A30, 10mm laparoscope is placed through the cannula and the intra-abdominal contents are inspected. The secondary surgiport trocars are then inserted under direct vision. A 5mm trocar, through which the clip applier will be positioned, is placed on the contralateral side of the hernia. An ipsilateral 5mm trocar constitutes the other secondary cannula, both working cannulas are placed lateral to the rectus sheath at the umbilical level.

Laparoscopic hernia exposure

The hernia sac is retracted into the abdominal cavity; the extra peritoneum is subsequently utilized to cover the preperitoneal prosthesis.

A dissecting scissor instrument or hook is used to create the peritoneal incision. An incision of the wall of the peritoneum was made starting at a level of the superior margin of the internal inguinal ring at the level of the epigastric vessels. It was extended medially up to the residue of the umbilical artery and laterally for 3 to 4cm past the inguinal ring for a total length of 7 to 8cm.

In the presence of direct hernias, the hernial sac was directly isolated and reduced. In the case of indirect inguinal hernias the preperitoneal parapubic adipose tissue was carefully dissected medially to expose the horizontal pubic ramus and Cooper's ligament. Accurate dissection of the preperitoneal retrovesical tissue permits easier positioning of the mesh. The internal inguinal ring was then explored, isolating and reducing the hernial sac; this maneuver was performed to reveal the presence of perihernial lipomas, which could then be removed. Once the spermatic cord had been freed from the peritoneal wall, the prosthesis was positioned.

Hernia repair

Prosthesis is utilized to provide the scaffolding which facilitates scar formation. The prosthesis closes the internal inguinal ring and reinforces the posterior wall of the inguinal canal.

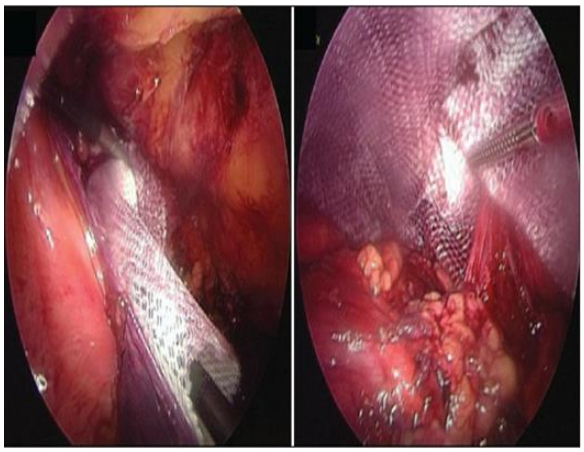

Fig (1) Reduction of hernia sac and lipoma with upward traction.

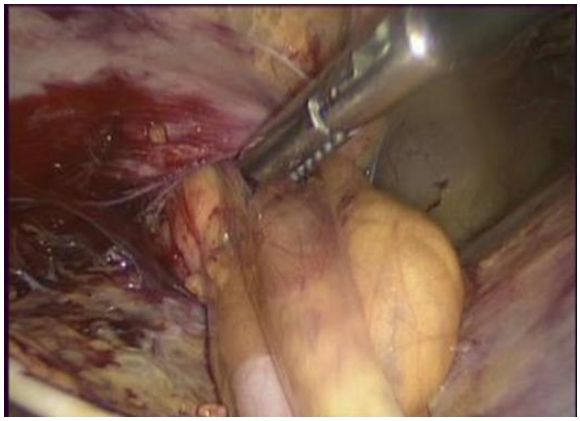

Fig (2) Introduction of the mesh.

A piece of polypropylene mesh measuring about 10*x*15 (depending on the size of the defect) positioned in the peritoneal location. This mesh is rolled into a cylinder, pulled retrograde into the peritoneal cavity through the 5mm trocar and delivered to the preperitoneal position.

The mesh is placed directly over the internal inguinal ring and intraperitoneal region of the posterior aspect of the inguinal canal. Thus, the prosthesis is directly exposed to the abdominal viscera.

In randomized trials:

- 25 hernias were repaired with fixation of mesh by tackers.
- 25 hernias were repaired without mesh fixation. The prosthesis is fixed in place (by the effect of intraabdominal pressure) after closure of the peritoneal flaps over it by stitches using intracorporeal suturing.

Finally, the site of the 3 ports is closed by simple stitches.

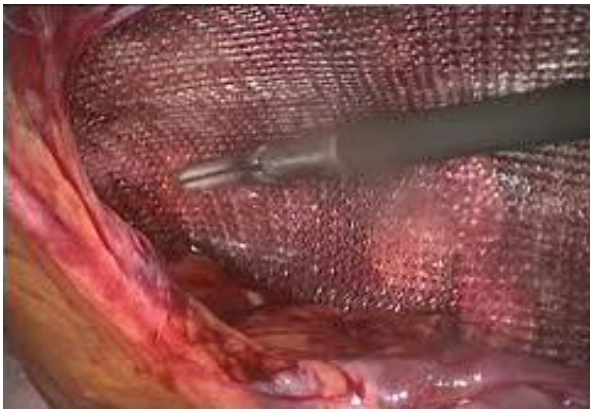

Fig (3) Mesh overlying the defect.

2.2 Postoperative management and follow-up

Antibiotic was prescribed for all patients post-operatively. Patients were permitted to return to home 24 to 72hrs after completion of the operation. Essentially no inguinal discomfort is reported. No enforced period of inactivity is required. Patients are asked to return for follow-up about one week after their surgery.

Parameters assessed

Certain parameters were assessed during the operative, postoperative and follow-up periods for evaluating the procedure and its consequences and benefits including:

2.2.1 Intraoperative parameters

1. Intra-operative time. (In minutes) is calculated from the induction of pneumoperitonium till closure of the wounds.
2. Intra-operative injury including:

- Vascular injury.
- Visceral injury.

2.2.2 Postoperative parameters

1. Mesh migration.
2. Recurrence rate.
3. Analgesic intake.
4. Nerve entrapment.
5. Mesh infection.
6. Length of stay.
7. Cost.

Follow up at 1 week, 1 month, 3 month and 6 month.

3. Statistical analysis

Data were statistically analyzed by Microsoft Excel ® 2010, Statistical Package for Social Science (SPSS) ® Ver. 20 and Minitab ® statistical software Ver. 16. Data were revealed as mean and standard deviation for further analysis.

Fifty patients divided into two groups were inspected postoperatively to evaluate the effect of mesh fixation versus non fixation approach. Comparison between both groups regarding sex, age, operation time and postoperative hospital stay were performed by using independent t test to detect the level of significance.

Finally, comparison between both groups regarding post-operative complications was performed using Chi square test to detect the significance level. The significant level was set at $P \leq 0.05$.

4. Results

In this study 50 hernial defects have been closed laparoscopically by TAPP repair. Patients were followed up by routine clinical examination for 6 months. The data of this study include the following items and results:

4.1 Sex

All patients were males are divided to two group each group contain 25 male patients.

Table (1) Comparative study between group I and group II as regard sex

Groups	Sex		Total	
	Male			
	No.	%	No.	%
Group (I) Mesh Fixation	25	50	25	50
Group (II) Non Fixation	25	50	25	50
Total	50	100.0	50	100.0

4.1 Age

First of all, comparison between both groups regarding age of the patients was performed. Mean age for group I and group II were 35.2 and 28 years respectively.

Independent t test was performed to detect the level of significance between both groups regarding patient`s age which demonstrated that there was insignificant difference between both groups (P-value > 0.05) regarding patient`s age (no bias), as listed in Table (2).

Table (2) Comparative study between both groups regarding patient's age.

	fixation	N	M	SD	P-value
Age	Mesh Fixation (Group I)	25	35.2	12.448	0.7.983*
	Non fixation (Group II)	25	28	13.187	

Where:

N; Number, M; Mean, SD; standard Deviation, P; Probability level; *; insignificant difference.

4.3 Operation time

Comparison between both groups regarding operation time of the patients was performed. Mean operation time for group I and group II were 163.333 and 109.222 minutes respectively.

Independent t test was performed to detect the level of significance between both groups regarding operation time which demonstrated that there was significant difference between both groups (P-value < 0.05) regarding operation time as listed in Table (3).

Table (3) Comparative study between both groups regarding operation time.

	fixation	N	M	SD	P-value
Operation time	**Mesh Fixation (Group I)**	25	163.333	35.1866	0.00**
	Non fixation (Group II)	25	109.222	23.6112	

4.4 Hospital stay

Comparison between both groups regarding hospital stay of the patients was performed. Mean hospital stay time for group I and group II were 2.45 and 1.67 days respectively.

Independent t test was performed to detect the level of significance between both groups regarding hospital stay time which demonstrated that there was significant difference between both groups (P-value < 0.05) regarding hospital stay as listed in Table (4).

Table (4) Comparative study between both groups regarding hospital stay.

	Fixation	N	M	SD	P-value
Hospital stay	**Mesh Fixation (Group I)**	25	2.45	1.39	0.0065**
	Non fixation (Group II)	25	1.67	0.00017	

4.4 Cost of the operations

Comparison between both groups regarding the cost of the operations was performed. Mean cost for group I and group II were 6500 and 4700 pounds respectively Table (5).

Table (5) Comparative study between both groups regarding cost of the operations.

	Fixation	N	M	SD	P-value
	Mesh Fixation (Group I)	25	6500	447.21	0.0065**
Cost	**Non fixation (Group II)**	25	4700	203.06	

4.5 Postoperative complications

Comparison between both groups regarding postoperative complications of the patients was performed. Percentage count for mesh-fixation (group I) and non-fixation (group II) were 93.3 % for no complications, 0.0 % and 6.7 % respectively for intra-peritoneal haematoma, 6.7 % and 0.0 % respectively for testicular edema.

Chi square test was performed to detect the level of significance between both groups regarding hospital stay time which demonstrated that there was insignificant difference between both groups (P-value > 0.05) regarding postoperative complications as listed in Table (6).

Table (6) Comparative study between both groups regarding postoperative complication.

		Complications							
		None		Intra-peritoneal haematoma		Testicular edema		Subcutaneous theroma	
		N %	Count	N %	Count	N %	Count	N %	Count
Fixation	**Non Fixation (Group II)**	92%	23	0.0%	0	4%	1	4%	1
	Mesh Fixation (Group I)	96%	24	4%	1	0.0%	0	0.0%	0

5. Discussion

Repair of an inguinal hernia is one of the most common elective operations performed in general surgery. Since Ger described the first laparoscopic technique in 1982, a series of technical modifications has been made in laparoscopic and open hernia repairs, pressed by the need to avoid recurrence.

Various methods have been devised for the fixation of the prosthetic mesh in laparoscopic inguinal hernia repair, including the use of staples, tackers, sutures, or more recently, polycyanoacrylate derivatives. Neuropathic complications have occurred with the use of staples or tackers. The prevalence of these complications for primary hernias varies from 0 to 3% which increases to 5.7% for recurrent hernia repairs [13].

Avoiding the use of staples or tackers for mesh fixation also helps decrease the operative cost, which is a major need, especially in developing countries [14].

In the present study, 49 patients with inguinal hernia one of them was bilateral inguinal hernia underwent laparoscopic transabdominal preperitoneal hernia repair under general anesthesia. This is a randomized controlled study for patients who are admitted for laparoscopical treatment of inguinal hernia. All patients are studied as regards their age, sex, intra operative time, intra and post- operative compilications and hospital stay. The age of the patients included in this study was ranging from 22 to 53 years.

Two groups were established:

Group I: contain 25 patients treated by mesh fixation

Group II: contain 25 patients treated by mesh non fixation

All patients were followed-up for a period of 6 months.

The average operative time for TAPP with fixation method was 65.7 minutes [15]. Also MRC trial group had an average time of TAPP with fixation method of 58.4 minutes.

In this study, the operative time was ranging from 75 to 140 minutes with a mean of 163.33 minutes in mesh fixation group and from 45 to 90 minutes with a mean of 109.22 minutes in mesh non fixation group.

Lovisetto, claims that (The mean duration of intervention was 54 minutes (range, 30–95 minutes) in the Tissucol (fibrin glue) group versus 40 minutes (range, 25–105 minutes) in the staples group ($P < 0.001$)) [16]. The wide range in operative time was due to variability in the difficulty of the cases. There was significant difference in operative time between mesh fixation group and mesh non fixation group so fixation is a major factor that increases operative time.

Complications occur during and after TAPP at a rate of 6% to 31%. Excluding laparoscopic access associated injuries, intraoperative complications include bladder injury, injury to the epigastric vessels and to the spermatic cord [17]. The average time of hospital stay is 1 day [18]. Mean hospital stay was 1.52 +/- 0.51 in the TAPP group [19].

In this study hospital stay was 1 to 4 days with average time of 2.45 day in mesh fixation group and 1.67 day in mesh non fixation group. One case spent 4 days in the hospital, it had intra-peritoneal haematoma .There was significant differences between the two groups in length of hospital stay as (P-value < 0.05). The major advantage of laparoscopic repair had been the patient's ability to return to full activity, including strenuous activities within one month.

Mesh migration is an infrequent occurrence, and is rarely reported in the literature. Method of fixation, as well as type of mesh, may have contributed to this problem. The method of fixation may affect migration rates by altering the tensile strength and degree of movement of the mesh. The nature of the biomaterial is also important, as it affects the extent and degree of interaction with the surrounding tissue [20].

In this study no reported cases of mesh migration with using polyprolene meshes with average size 10 x 15 cm. Mesh infection is feared because it is difficult to eradicate without removing the mesh and can become clinically apparent many years after implantation. Mesh infection remains about 0.1–3%. Sepsis due to infection of the patch is an uncommon complication [21]. During the period of this study no reported cases of mesh infection.

Deans et al. suggested that medial recurrences might occur owing to the rolling away of the mesh from the pubic ramus to expose the Hesselbach's triangle. Fiennes and Taylor stated that desufflation after laparoscopic hernioplasty tends to elevate the lower edge of the mesh and predisposes to migration of the inferomedial aspect from the space of Retzius in the presence of a direct defect.

Recurrence rates of 2% or less are now routinely reported from specialty centers performing either laparoscopic or conventional tension-free repairs [22].

Ceccarelli,. Proved that (No recurrence or incisional infections were observed during follow-up in either group. The mean operative time, time to ambulation, and hospitalization expense of the non-fixation group were all significantly reduced compared to those of the fixation group) [23].

The two most common causes of recurrence are incomplete dissection of the myopectineal orifice and inadequate size of the mesh. Lowham et al. reviewed

13 videotapes of hernias that had recurred in the multicenter trial by Fitzgibbons et al. and found that incomplete dissection of the myopectineal orifice was the primary cause of recurrence. There were other causes also, but in many cases they were secondary to inadequate dissection [24].

Table (7) Comparative data—recurrence.

Author	Number of hernia repairs	% recurrence
Khazanchee et al (2001)	105	2.9
Beattie et al (2000)	89	Nil
Tamme et al (2003)	5203	2.6
Ferzli et al (1999)	50	Nil
Cocks et al (1998)	148	4
Present study	50	Nil

Smith et al. randomized 502 consecutive patients undergoing elective TAPP to have stapled or non-stapled hernia repairs. A total of 263 non-stapled and 273 stapled repairs were performed and the median follow-up was 16 months. There was no statistical difference in the incidence of recurrence (0 out of 263 in non-stapled group, 3 out of 273 in stapled group). The authors concluded that it was not necessary to secure the mesh during laparoscopic TAPP inguinal hernia repair [25]. In this study no reported cases of hernia recurrence.

Stark et al. claimed that (average rate of nerve entrapment was 3%. Reduction in the number of clips used and careful attention to the autonomic nerve course during preparation and placement of mesh led to a significant reduction in the occurance of nerve irritations.)[26].

Olmi. Says that (he found differece in postoperative pain among TAPP with fixation method rather than no fixation method) [27].

The nerves at risk are the lateral cutaneous nerve of the thigh (most commonly damaged) and the genitofemoral nerve. The injury may occur by direct trauma, or nerve entrapment may be the result of a fibrous scar around the staples or tackers. Nerve injuries caused by staples or tackers leads to more severe prolonged pain, which may require surgical removal of the offending staples. A way to prevent these injuries would be to individually identify the nerves and preserve them. However, because of the variable course of the nerves in the operative field, there is little possibility of identifying them without time-consuming dissection. The best way of preventing these injuries seems to be to avoid using these devices altogether [28].

In this study there is no evidence of nerve entrapment and this is due to meticulous care to avoid the sites of nerves with no reported cases of severe pain. Difference in cost between (mesh fixation) group and (mesh non fixation) group was that of the price of tackers used in mesh fixation. So mesh fixation is cost effective which is important in our country.

6. Conclusion

From this study we can conclude:

- Laparoscopic inguinal hernia repair is better than open repair because of less postoperative discomfort and pain, reduced recovery time that allows earlier return to full activity, easier repair of a recurrent hernia, the ability to treat bilateral hernias concurrently, the performance of a simultaneous diagnostic laparoscopy, ligation of the hernia sac at the highest possible site, improved cosmeses and decreased incidence of recurrence.
- No significant difference between mesh fixation and non fixation as regard age and postoperative complications and post operative analgesia.
- There was significant difference between mesh fixation and non fixation as regard operation time, cost and hospital stay.

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