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Mahmoud Mohamed Ibrahim Eisa
General Surgery department, Faculty of Medicine- Al-Azhar University

Marwan Mansour Mohamed
General Surgery department, Faculty of Medicine- Al-Azhar University

Mohamed Abdelrahman Mohamed Ebrahim
General Surgery department, Faculty of Medicine- Al-Azhar University, mohamedabdo182.ma@gmail.com

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ORIGINAL ARTICLE

Evaluation of Lightweight Mesh in Laparoscopic Inguinal Hernia Repair

Mahmoud Mohamed Ibrahim Eisa, Marwan Mansour Mohamed, Mohamed Abdelrahman Mohamed Ebrahim*

General Surgery Department, Faculty of Medicine, Al-Azhar University, Egypt

Abstract

Background: **When compared to heavier-weight meshes, lighter meshes are thought to integrate into the abdominal wall with less inflammation because they have wider pores and stimulate the formation of collagen.**

Aim: **The aim of this study was to compare and offer a concise and current review of the results of laparoscopic inguinal repairs utilising either brand-new lightweight mesh or conventional heavyweight mesh in controlled investigations.**

Patients and methods: **This research was conducted at Al-Matarya teaching hospital and El-Hussein Hospital of Al-Azhar University as a two-arm single-blinded randomised prospective controlled trial. All trial participants underwent laparoscopic TAPP inguinal hernia repair utilising one of the two types of mesh from February 2 through February 5, and they were subsequently monitored from March 6 through March 11, 2022.**

Results: **Regarding operative time, there was a statistically significant difference between groups (A) and (B) (table 3). The average operating duration in group (A) was 117.53 min, but it was less in group (B), 100.66 min.**

Conclusion: **In laparoscopic TAPP repair of unilateral uncomplicated inguinal hernias, utilising partially absorbable lightweight mesh is preferable to using nonabsorbable heavyweight mesh in terms of postoperative pain and recovery time. Although there was no statistically significant difference between the heavyweight and lightweight mesh in the prevalence of chronic pain and seroma development.**

Keywords: Laparoscopic inguinal hernia, Lightweight mesh, Repair, Transabdominal preperitoneal (TAPP)

1. Introduction

75% of abdominal wall hernias are inguinal hernias, which have a lifetime risk of 27% for men and 3% for women. The surgical treatment of these hernias is among the most frequently carried out surgical procedures worldwide.[1]

Laparoscopic inguinal hernia repair has been shown in numerous studies to have advantages over conventional therapy, including reduced post-operative pain, a decreased need for medication, and a quicker return to work. Laparoscopic repair has certain additional disadvantages, such as the following: Early in a surgeon's career, there are longer surgeries, steeper learning curves, higher expenses, and higher recurrence and complication rates.[2]

The laparoscopic repair can be done using either the transabdominal preperitoneal (TAPP) or completely extraperitoneal (TEP) techniques (TEP). In comparison to open surgery, laparoscopic inguinal hernia repair has a number of benefits, including less postoperative discomfort, a speedy recovery, an early return to work and normal daily activities, a low recurrence rate, and an improved quality of life. Tension-free mesh is now most commonly used to treat inguinal hernias.[3]

Lightweight meshes are thought to integrate into the abdominal wall with less inflammation than heavy meshes because they contain larger pores and are thought to stimulate the formation of collagen.[4]

This led to a rise in interest in adopting lighter-weight meshes for all forms of hernia repair due to

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* Corresponding author at: Faculty of Medicine, Al-Azhar University, Cairo, 11474, Egypt.
E-mail address: mohamedabdo182.ma@gmail.com (M.A.M. Ebrahim).

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the anticipated advantages over heavyweight mesh (HWM). Patient comfort is improved with less awareness of the mesh, and routine activities can be resumed sooner, and a quicker recovery from surgery are a few of these. Less chronic pain also leads to better quality of life.[5]

This work compared the results of laparoscopic inguinal repairs performed with either new lightweight mesh or conventional heavyweight mesh in randomised controlled trials and provided a clear, up-to-date overview of those results.

2. Patients and methods

This study was a two-arm single-blinded randomized prospective controlled trial done at El-Hussein Hospital of Al-Azhar University and Al-Matarya teaching hospital. All patients included in the study have been subjected to laparoscopic TAPP inguinal hernia repair using either of the two types of mesh over a period from 2/2022 to 5/2022 then they were followed up over a period from 6/2022 to 11/2022.

20 Patients were randomly allocated in two groups: Group (A): 10 patients to be subjected to laparoscopic TAPP repair of inguinal hernia using lightweight mesh. Group (B): 10 patients to be subjected to laparoscopic TAPP repair of inguinal hernia using heavyweight mesh.

Inclusion criteria: Patients with inguinal hernias whether direct or indirect, patients with non-complicated inguinal hernias (reducible, not obstructed nor strangulated), patients with unilateral inguinal hernias, adult age above 18 years and both genders.

Exclusion criteria: Patients with complicated inguinal hernias, patients with persistent cause of increased intra-abdominal pressure, patients with bilateral inguinal hernias, age below 18 years, patients who have co-morbidities that contraindicate laparoscopic surgery and patients who are generally unfit for surgery.

2.1. Study procedure

Full history taking from patients including name, age, family history, residence, past medical history, past surgical history, with emphasis on smoking, work requiring lifting heavy weights, causes of increased intra-abdominal pressure, repeated vomiting, abdominal pain, distension and absolute constipation and asking about complications.

Physical examination: In addition to the general physical examination, abdominal examination including other hernia orifices and local examination of the inguinal hernia. Examination of the scrotum, scrotal duplex and ultrasound in males. In old males, Digital examination of the anal canal can identify enlarged prostate as a cause of chronically increased intra-abdominal pressure.

Laporatory investigation: Routine preoperative labs as (CBC, LFTs, KFT, coagulation profile, RBS and virology.

Imaging modalities: superfacial and detailed abdomen and pelvis ultrasound for assessment of prostatomegaly and other abnormality.and Chest radiogragh.

Types of meshes used: All meshes used were of the same size 15 cm × 15 cm: **ULTRAPRO**: ULTRAPRO is a thin, partially absorbable mesh (for patients in group A). Large-pored polyglecaprone monofilaments and polypropylene are used in its construction (3–4 mm). Due to hydrolysis, the polyglecaprone monofilaments are absorbed in 90–120 days. It weighs 28 g/m^2 in size (the polypropylene part that is not absorbed).**Surgipro**: (for patients of group B): Surgipro is a heavyweight nonabsorbable mesh. It is made of polypropylene monofilaments with small pores. Its weight is 80–85 g/m^2.

TAPP repair of inguinal hernia: antibiotic coverage before surgery the patient is lying on his or her back with both arms tucked under. Surgery is done when the patient is unconscious. Pneumoperitoneum establishment required CO_2 at 14 mmHg.

The most recent surgery entailed placing two trocars, one 10 mm and one 5 mm, 5–7 cm laterally on the right and left flanks, respectively, in the same transverse plane as the umbilical port. To place the camera, a 10 mm trocar was initially inserted at the umbilicus. Once the trocars have been inserted and a pneumoperitoneum has been formed, the patient is placed in the steep Trendelenburg position. We look at the skeleton of the groyne. It is vital to identify the vas deferens, spermatic vessels, and inferior epigastric vessels. The supposed "Mercedes-Benz" emblem is made up of these three structures. The diagnosis is a hernia. The peritoneum is incised several millimetres above the myopectineal orifice, from the anterior superior iliac spine to the lateral leaflet of the medial umbilical ligament. The pubis, Cooper's ligament, and iliopubic tract were then visible when the peritoneum flaps from the spermatic cord components were dissected upward and downward. It is done to dissect the hernia sac.

It's important to preserve the spermatic and vas deferens arteries when dissecting the sac. The sac should be entirely dissected free from the cord if it is tiny enough, then reinserted into the peritoneal cavity.

In order to avoid the nearby auxiliary obturator vein, one additional tack is placed laterally above the iliopubic tract, Moreover, the mesh is fastened to Cooper's ligament with two extra tacks or nonabsorbable sutures. To adequately cover the myopectineal aperture, the mesh should be positioned with a tiny midline overlap. The peritoneal flap is then moved to cover the mesh in its original location. In order to prevent intestines from herniating through the peritoneum and into the preperitoneal region, we utilise closely spaced tacks or absorbable sutures. **Meshes used in the study:** All meshes used were of the same size 15 cm × 15 cm: For patients of group (A), ULTRAPRO lightweight partially absorbable mesh was used Figs. 1 and 2.

For patients of group (B), Surgipro heavyweight nonabsorbable mesh was used Figs. 3–7.

2.2. Follow-up

The patients were monitored for postoperative pain and the time needed by the patient to return to the physical activity (first day to return to routine nonweight-bearing activity) was recorded. They were followed up for complications, such as chronic groin pain, seroma/hematoma formation, mesh infection, and hernia recurrence.

Pain was scored according to Numeric Rating Scale (NRS), where 0 = no pain and 10 = extremely painful. The pain is scored in the first 24 h, after 1 week, 1 and 6 months.

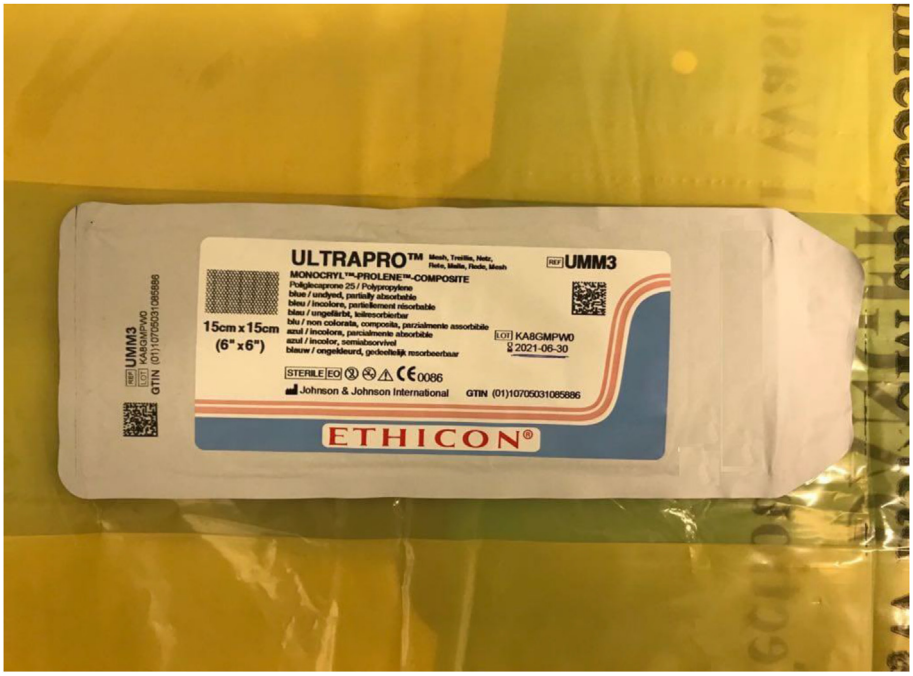


Fig. 1. ULTRAPRO (ETHICON) lightweight partially absorbable mesh 15 cm × 15 cm (packed).

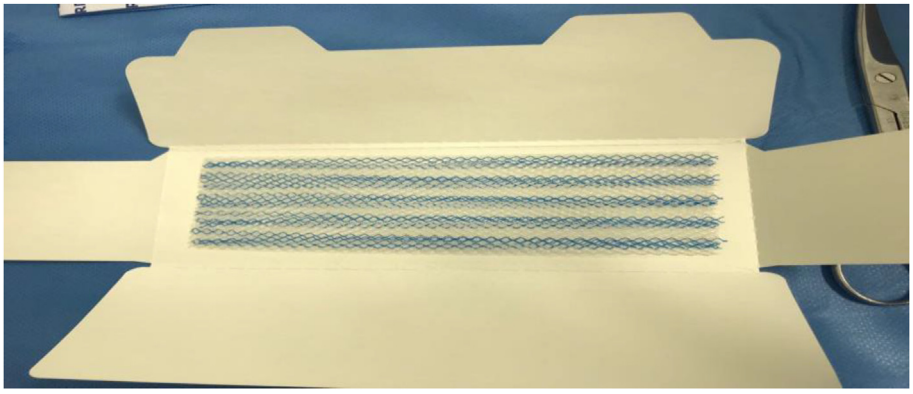


Fig. 2. ULTRAPRO (ETHICON) lightweight partially absorbable mesh 15 cm × 15 cm (unpacked).

Fig. 3. Surgipro (COVIDIEN) heavyweight nonabsorbable mesh 15 cm × 15 cm (packed).

3. Results

Our prospective study included 20 patients who were admitted to El-Hussein Hospital of Al-Azhar University and Al-Matarya teaching hospital over the period from 2/2022 to 5/2022 with 6 months follow-up period from 6/2022 to 11/2022, and completed in 100% of the patients (20 patients).

There is no statistically significant difference between **group (A)** and **group (B)** regarding patients' demographics including: gender, age and BMI (Table 1). Patients of **group (A)** were 100% males

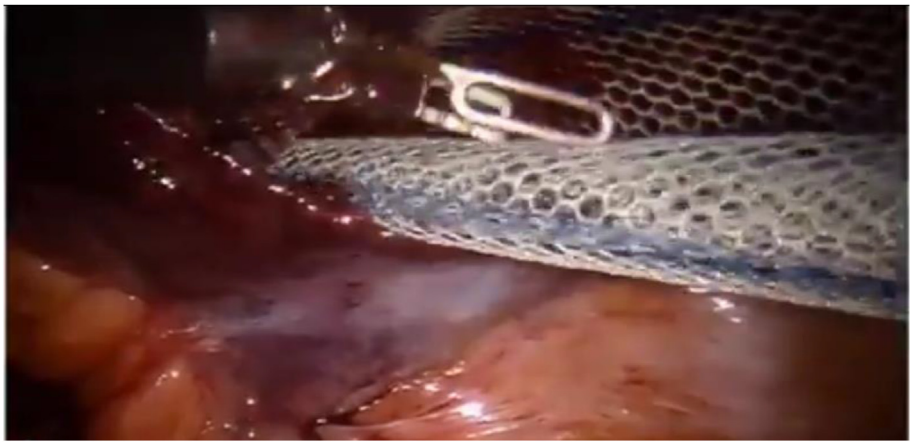


Fig. 4. The lightweight mesh introduced in the abdomen through one of the lateral ports.

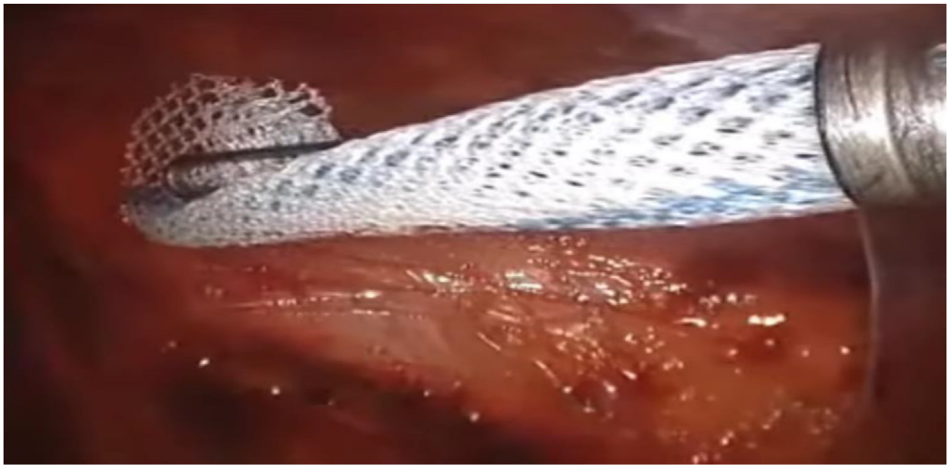
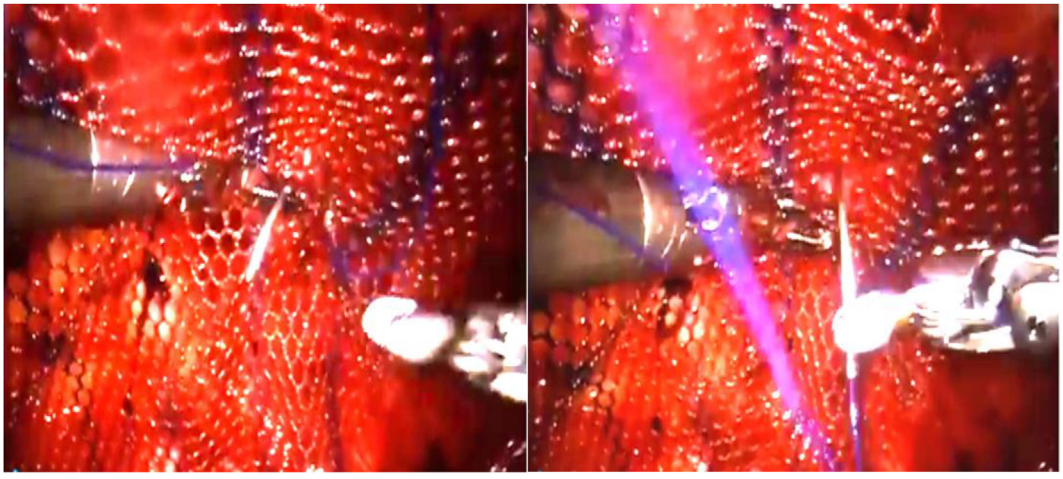


Fig. 5. The heavyweight mesh introduced in the abdomen through one of the lateral ports.



(a) (b)

Fig. 6. (a, b) Fixation of lightweight mesh using nonabsorbable sutures.

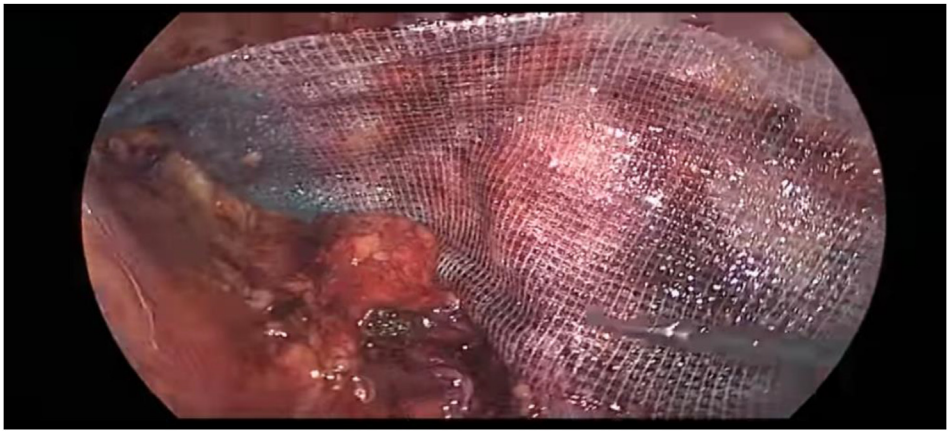


Fig. 7. Placement of heavyweight mesh in position.

Table 1. Demographic data of patients in both groups.

	Group A	Group B	*P* value	Sig.
	Number = 10	Number = 10		
Gender				
Male	10 (100.0%)	9 (90.0%)	0.305	NS
Female	0 (0.0%)	1 (10.0%)		
Age (yrs)				
Mean ± SD	39.80 ± 13.97	44.60 ± 16.34	0.489	NS
Range	23–66	19–70		
BMI(kg/m^2)				
Mean ± SD	27.65 ± 4.20	28.06 ± 3.40	0.813	NS
Range	23–33.4	22.8–33.9		

P-value >0.05: Nonsignificant; *P*-value <0.05: Significant; *P*-value <0.01: Highly significant.

with mean of age 39.8 years old±13.97 years and mean of body mass index (BMI) of 27.65 kg/m^2±4.2 kg/m^2, while patients of **group (B)** were 90% males and 10% females with mean of age 44.6 years old±16.34 years and mean of body mass index (BMI) 28.06 kg/m^2±3.4 kg/m2 (Table 1), Table 2.

There is no statistically significant difference between **group (A)** and **group (B)** regarding hernia characteristics: type (direct or indirect), side (right or left) and duration of complaint. In **group (A)**, 1 (10%) patients were complaining of **direct** inguinal hernia and 9 (90%) patients were complaining of **indirect** inguinal hernia, **in group (B)**, 2 (20%) patients were complaining of **direct** inguinal hernia and 8 (80%) patients were complaining of **indirect** inguinal hernia.

There was statistically highly significant difference between **group (A)** and **group (B)** regarding operative time (Table 3). In group (A), the mean operative time was 117 ± 7.53 min while in group (B), the mean operative time was **shorter**, 100 ± 6.67 min.

There was statistically highly significant difference between **group (A)** and **group (B)** regarding postoperative pain in first postoperative day, time needed by the patient to return to routine nonweight-bearing activity and postoperative pain after one week (Table 4).

There was no statistically significant difference between **group (A)** and **group (B)** regarding suffering of chronic pain in the inguinal region one month after surgery (Table 5).

Table 2. Hernia characteristics in both groups.

	Group A	Group B	*P* value	Sig.
	Number = 10	Number = 10		
Type of hernia				
Direct	1 (10.0%)	2 (20.0%)	0.531	NS
Indirect	9 (90.0%)	8 (80.0%)		
Side of hernia				
Left	3 (30.0%)	3 (30.0%)	1.000	NS
Right	7 (70.0%)	7 (70.0%)		
Duration of complaint				
Median (IQR)	13.5 (8–24)	11 (7–24)	0.820	NS
Range	6–30	5–60		

P-value >0.05: Nonsignificant; *P*-value <0.05: Significant; *P*-value <0.01: Highly significant.

Table 3. Operative time in both groups.

	Group A	Group B	*P* value	Sig.
	Number = 10	Number = 10		
Operative time				
Mean ± SD	117.00 ± 7.53	100.00 ± 6.67	0.000	HS
Range	105–130	90–110		

P value > 0.05: Nonsignificant; *P* value < 0.05: Significant; *P* value < 0.01: Highly significant.

Table 4. Postoperative short-term assessment in both groups.

	Group A	Group B	*P* value	Sig.
	Number = 10	Number = 10		
Postoperative pain in first day				
Mean ± SD	6.00 ± 0.67	7.00 ± 0.82	0.008	HS
Range	5–7	6–8		
Time to return to routine activity				
Mean ± SD	38.40 ± 12.39	67.20 ± 10.12	0.000	HS
Range	24–48	48–72		
Postoperative pain after one week				
Mean ± SD	0.60 ± 0.70	1.70 ± 0.82	0.005	HS
Range	0–2	1–3		

P-value >0.05: Nonsignificant; *P*-value <0.05: Significant; *P*-value <0.01: Highly significant.

Table 5. Chronic pain after one month in both groups.

	Group A	Group B	*P* value	Sig.
	Number = 10	Number = 10		
Chronic pain after one month				
No	9 (90.0%)	5 (50.0%)	0.051	NS
Yes	1 (10.0%)	5 (50.0%)		

P-value >0.05: Nonsignificant; *P*-value <0.05: Significant; *P*-value <0.01: Highly significant.

Table 6. Long-term assessment after six months in both groups.

	Group A No. (%)	Group B No. (%)	*P* value	Sig.
Chronic pain at 6 month				
No	9 (90.0%)	6 (60.0%)	0.121	NS
Yes	1 (10.0%)	4 (40.0%)		
Seroma after 6 month				
No	9 (90.0%)	7 (70.0%)	0.264	NS
Yes	1 (10.0%)	3 (30.0%)		
Mesh infection at 6 month				
No	10 (100.0%)	10 (100.0%)	–	–
Yes	0 (0.0%)	0 (0.0%)		
Recurrence				
No	10 (100.0%)	10 (100.0%)	–	–
Yes	0 (0.0%)	0 (0.0%)		

P-value >0.05: Nonsignificant; *P*-value <0.05: Significant; *P*-value <0.01: Highly significant.

There was no statistically significant difference between **group (A)** and **group (B)** regarding suffering of chronic pain at the inguinal region, seroma/hematoma formation at the inguinal region, presence of signs of mesh infection and recurrence of the inguinal hernia (Table 6).

4. Discussion

Patients in the lightweight mesh group and the heavyweight mesh group had similar demographic and clinical features. In our investigation, There was a statistically significant difference in the mean operating time between the lightweight mesh group and the heavyweight mesh group (117.00 7.53 min vs. 100.00 6.67 min, P 0.001). Contrary to our findings, Prakash et al. [6] found that the lightweight mesh group's mean operative time was longer than the heavyweight mesh group's due to the lightweight mesh group's high memory and difficulty handling intraoperatively due to its weight (60.2 13.3 min vs. 57.3 13.8 min, $P = 0.22$); however, this distinction was not statistically noteworthy. 131 individuals with inguinal hernias participated in the trial; 65 received lightweight mesh, and 66 received heavyweight mesh. In addition, Eskandaros and Hegab's.,[7] discovered that the mean operating time was longer in the lightweight mesh group than the heavyweight mesh group (75.221 5.756 min vs. 72.267 8.916 min, $P = 0.245$) in a prospective assessment of 60 inguinal hernia patients who underwent laparoscopic TAPP repair. According to Bangash et al.,[8] the mean operating time was longer in the lightweight mesh group than in the heavyweight mesh group, despite the fact that this difference was not statistically significant. In a prospective trial of 192 patients with inguinal hernias, 96 of whom were placed in the heavyweight mesh group and 96 in the lightweight mesh group, the mean time was (74.7 19.1 vs. 68 17.3 min, $P = 0.91$).In our study, the first postoperative day of the lightweight mesh group was less uncomfortable than the heavyweight mesh group overall (6.00 0.67 vs. 7.00 0.82, P0.001). Also, Eskandaros and Hegab's.,[7] found that the mean score of postoperative pain in first postoperative day was lower in lightweight mesh group than in heavyweight mesh group with statistically highly significant difference (2 ± 0.926 vs. 4.2 ± 0.944). Contrary to our results, Prakash et al.,[6] found that there is no statistically significant difference between lightweight mesh group and heavyweight mesh group regarding mean postoperative pain score in first day postoperative (2.2 ± 1 vs. 2.1 ± 0.8, $P = 0.6$).

Currie et al.,[9] found that the postoperative pain scores from three of those trials did not statistically differ between the groups of lightweight mesh and heavyweight mesh on the first postoperative day ($P = 0.47$) in a meta-analysis of eight randomised controlled trials that included 1592 patients with inguinal hernias. In our study, the mean postoperative pain score in the lightweight mesh group and the heavyweight mesh group differed statistically significantly from one another (0.6 0.7 vs. 1.7 0.82, P0.001). Furthermore, Eskandaros and Hegab's.,[7] demonstrated that after one week, the mean postoperative pain score in the lightweight mesh group was statistically considerably lower than that in the heavyweight mesh group (1.133 0.990 vs. 3.489 1.079). The groups utilising lightweight mesh and those using heavyweight mesh did not show any statistically significant differences after one week (1.4 0.9 vs. 1.5 0.9, $P = 0.11$), according to Prakash et al.,[6] Furthermore, Currie et al.,[9] found no indication of a significant difference in postoperative pain scores between the groups utilising lightweight mesh and heavyweight mesh after 7 days ($P = 0.47$). Patients in our study who received lightweight mesh recovered from surgery more quickly than those who received heavyweight mesh (38.40 12.39 vs. 67.20 10.12 h, P0.001). Patients in the lightweight lattice bunch got back to work significantly quicker than those in the heavyweight network bunch, as per Eskandaros and Hegab's.,[7] examination (5.033 1.189 days versus 7.867 2.662 days). Our examination found no genuinely massive contrast in the occurrence of relentless crotch torment at multi month or a half year between the two gatherings. At one month, the lightweight cross-section bunch exhibited a lower occurrence of diligent crotch torment than the heavyweight network bunch (10% versus half, $P = 0.51$). There was no genuinely huge contrast between the gatherings for the predominance of constant crotch distress at a half year (10% versus 40%, $P = 0.121$) between the lightweight lattice bunch and the heavyweight network bunch. As per Prakash et al.,[6] review, which upholds the discoveries of our examination, there was no genuinely tremendous distinction between the two gatherings at 3, 6, or a year with regards to the rate of ongoing crotch inconvenience. The pervasiveness of constant crotch torment, which was 21.3% at 90 days, 9.9% at a half year, and 2.3% at a year, didn't shift fundamentally with time. Despite the fact that our review uncovered that the lightweight cross-section bunch had a lower frequency of seroma development — 10% — than the heavyweight network bunch — 30% — there was no genuinely massive contrast between the two gatherings ($P = 0.246$), subsequently seromas were dealt with

safely. Eskandaros and Hegab's.,[7] found similar results, with seroma creating in the heavyweight network bunch (6.7%) and the lightweight cross-section bunch (4.4%) yet no recognizable distinction. Furthermore, neither the utilization of light or weighty cross-section during laparoscopic fix essentially affected seroma development ($P = 0.84$) in the seven preliminaries that were remembered for Currie et al.,[9] As per Bangash et al.,[8] seroma happened in 6 patients out of 96 in the lightweight lattice bunch (6.25%) and 4 patients out of 96 in the heavyweight network bunch (4.16%), in spite of the fact that there was no measurably tremendous distinction between the two gatherings ($P = 0.34$). Following a 6-month follow-up in our preliminary, no patients in the gatherings utilizing lightweight lattice or heavyweight network had contaminations or required network substitution. As per Prakash et al.,[6] none of the 131 patients expected network evacuation because of cross-section related diseases. Also, Eskandaros and Hegab,[7] showed that no patients developed infection in both groups. We found in our study that heavyweight mesh was easier to be handled by the surgeon and hence had easier fixation and shorter operative time. However, lightweight mesh was accompanied with less postoperative inflammatory reaction may be as it is partially absorbable and the absorbable part to be absorbed after 3 weeks and be completely absorbed after 3 months, and hence less postoperative pain at the first postoperative day and at one week postoperative, and early return to routine daily activities. We found that newer lightweight mesh didn't overweigh standard heavyweight mesh in long-term complications after a 6 months follow-up, including chronic pain, seroma formation, mesh infection and hernia recurrence.

4.1. Conclusion

Although it takes longer to do, regarding postoperative discomfort and healing time, laparoscopic TAPP repair of unilateral uncomplicated inguinal hernias with partially absorbable lightweight mesh is preferable to utilising nonabsorbable heavyweight mesh. Despite the fact that there is no statistically significant distinction between light and heavy mesh, the former was connected to a lower frequency of persistent pain and seroma development. Heavyweight and lightweight mesh both produced the same results with regard to mesh infection and hernia recurrence.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

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Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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