Comparative study between use of lightweight mesh versus heavyweight mesh in laparoscopic repair of inguinal hernia

Ahmed Abd El Aal Sultan[a], Ahmed El Saeed El Mosaad[b], Mahmoud Al-Molla[a]

Introduction Inguinal hernia repair with prosthetic mesh has become a standard practice; however, synthetic mesh can cause significant pain and interfere with patient activity. Lighter weight meshes (LWM) have been engineered that may be associated with fewer rates of complications and recurrence. Laparoscopic inguinal hernia repair has also significantly reduced postoperative recovery from inguinal hernia repair.

Aim This study aimed to compare outcomes of laparoscopic transabdominal preperitoneal repair of inguinal hernia using LWM versus using heavyweight mesh (HWM).

Materials and methods A prospective study was performed on 20 patients (10 in LWM group and 10 in HWM group) with unilateral primary inguinal hernia above 18 years old who underwent laparoscopic transabdominal preperitoneal inguinal hernia repair from July 2018 to October 2018. Postoperative complications such as pain, seroma, mesh infection, and recurrence were evaluated.

Results LWM is superior to HWM regarding postoperative pain on the first postoperative day and after 1 week and earlier time to return to routine daily activities, but with longer operative time. However, there is no statistically significant difference between LWM group and heavy and HWM group regarding postoperative long-term complications including chronic groin pain, seroma formation, mesh infection, and recurrence after 6 months of follow-up.

Conclusion LWM is superior to HWM in terms of postoperative pain and early return to routine activity but with longer operative time. Both meshes are similar in results regarding chronic pain, postoperative complications, and recurrence.

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[a]Department of General Surgery, Faculty of Medicine, Al-Azhar University, [b]Department of General Surgery, Al-Matarya Teaching Hospital, Cairo, Egypt

Correspondence to Ahmed Abd El Aal Sultan, MD, Lecturer of General Surgery, Faculty of Medicine Al-Azhar University, 125 el Khaleeg el Masry st. Dear el Malak, Hadaeek el Koba, Cairo, 11331, Egypt. orchid NO: https://orcid.org/0000-0003-1097-2615. Tel: 01005056641; e-mail: dr.ahmedsultan@azhar.edu.eg

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Introduction

Inguinal hernias account for 75% of all abdominal wall hernias, with a lifetime risk of 27% in men and 3% in women [1]. Repair of these hernias is one of the most commonly performed surgical procedures in the world [1].

Laparoscopic repair can be done by two main approaches: transabdominal preperitoneal (TAPP) and totally extraperitoneal. Laparoscopic repair of inguinal hernia has several advantages over open repair like less postoperative pain, early recovery, rapid return to work and usual activities, low recurrence rate, and better quality of life [2].

Tension-free mesh-based repairs are the most common method of inguinal hernia repair today [3]. Efficacy of the mesh repair is based on strengthening of weakened native tissue by a strong mesh aponeurotic scar tissue complex [4].

Chronic pain following hernia repair with mesh is thought to occur as a result of an excessive inflammatory response to the synthetic mesh with decreased tissue compliance and entrapment of surrounding neural structures [5]. First-generation synthetic meshes contained high concentrations of foreign material and have been shown to cause excessive inflammatory response [6]. Lightweight meshes (LWMs) have larger pores, and it is postulated that they encourage collagen production, which integrates the mesh into the abdominal wall with less inflammation compared with heavier weight meshes (HWM) [7].

This led to the growing interest in the use of LWM for all types of hernia repair based upon predicted benefits when compared with HWM. These include accelerated recovery with less postoperative pain [8] and earlier return to normal activity [8], increased patient comfort with reduced mesh awareness [9], and less chronic pain [10,11], with improved quality of life [12].

Materials and methods

The study was conducted as a two-arm single-blinded randomized controlled trial in El-Hussein Hospital of

Al-Azhar University and Al-Matarya Teaching Hospital.

The study included 20 patients randomly allocated in two groups: the first group is LWM group, and the second group is HWM. The patients were subjected to laparoscopic TAPP inguinal hernia repair between July 2018 and October 2018, and then they were followed up over 6 months from October 2018 to April 2019.

All patients gave an informed written consent before being included in the study.

Inclusion criteria

The following were the inclusion criteria:

(1) Patients with inguinal hernias whether direct or indirect.
(2) Patients with noncomplicated inguinal hernias (reducible, not obstructed, or strangulated).
(3) Patients with unilateral inguinal hernias.
(4) Adult age above 18 years.
(5) Both sexes.

Exclusion criteria

The following were the exclusion criteria:

(1) Patients with complicated inguinal hernias.
(2) Patients with bilateral inguinal hernias.
(3) Age below 18 years.
(4) Patients with persistent cause of increased intra-abdominal pressure.
(5) Patients who have comorbidities that contraindicate laparoscopic surgery.
(6) Patients who are generally unfit for surgery.

Materials

All meshes used were of the same size (15 cm×15 cm). They were as follows:

(1) ULTRAPRO (for patients of group A): ULTRAPRO is a lightweight partially absorbable mesh. It is made of polypropylene and polyglecaprone monofilaments with large pores (3–4 mm). The polyglecaprone monofilaments are absorbed within 90–120 days owing to hydrolysis. Its weight is 28 g/m^2 (the polypropylene part that is not absorbed) [13].
(2) 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 [13].

Preoperative evaluation included short history taking from patients, with emphasis on smoking, work requiring lifting heavyweights, causes of increased intra-abdominal pressure, repeated vomiting, abdominal pain, distension, and absolute constipation; general physical examination; abdominal examination including other hernia orifices; local examination of the inguinal hernia; and examination of the scrotum were done. Abdominal ultrasound, scrotal duplex, and ultrasound in males were done.

Surgical technique

All patients were subjected to laparoscopic TAPP repair of inguinal hernia under general anesthesia. Intravenous antibiotic (cefotax 1 g) was administered at the time of induction. Foley's urinary catheter was inserted after induction. Positioning of the patient on the operative table was in the supine position with the head tilted 15° down. Disinfection of the operative area of the skin by paining with betadine and draping the patient with exposure of the lower two-third of the abdomen were done.

A 10-mm umbilical port was inserted using the Hasson technique through an umbilical incision. Pneumoperitoneum was created through CO_2 introduction

through the umbilical port and maintaining the pressure at 12–15 mmHg. Another two 5-mm ports were inserted laterally at the same transverse plane of the umbilicus ~5–7 cm away from it. Dissection started with incision of the peritoneum from just anterior and medial to the ASIS to the medial umbilical fold. Both blunt and sharp dissection, and also traction and counter traction had been used for separating the sac off the anterior abdominal wall. Stoppa's parietalization technique had been used for dissection of the spermatic cord from the peritoneum by separating its elements from the peritoneum and peritoneal sac.

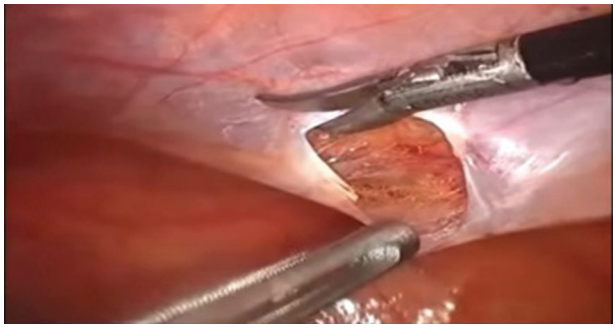
Mesh was rolled and loaded in the umbilical port. The mesh was then fixed into the position by nonabsorbable sutures. The superior border of the mesh was fixed to posterior rectus and fascia transversalis. Inferomedial corner was fixed to the Cooper's ligament and pubic bone.

With mesh duly fixed, peritoneal flaps were replaced over the mesh and were closed by nonabsorbable sutures.

At the end of surgery, the abdomen was examined for any possible bowel injury or hemorrhage. All instruments were removed followed by removal of all ports. The gas was released to deflate the pneumoperitoneum created. Skin incisions were closed.

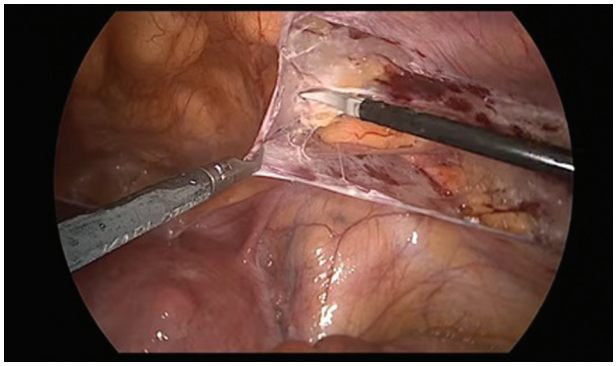
After recovery from anesthesia, the patient was sent to the inpatient ward wearing scrotal elevator. Early ambulation was advised to the patient. Feeding was started ~6 h postoperatively. The patient was discharged next day postoperatively, with follow-up after 1 week, 1, and 6 months (Figs 1–7).

Figure 1



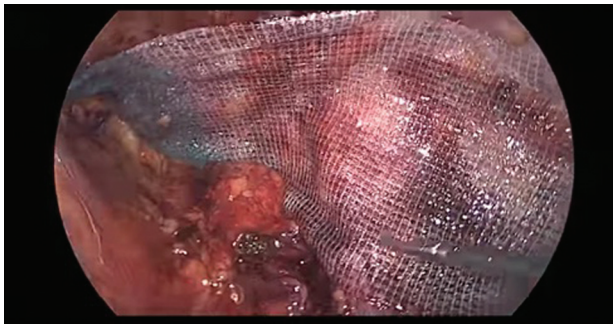
Starting incision of the peritoneum laterally just medial to ASIS.

Figure 2



Dissection of peritoneum inferomedially to Cooper's ligament.

Figure 3



Placement of mesh in position.

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).

Results

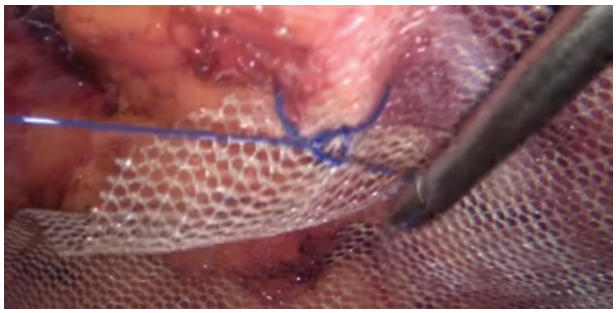
Patients' demographics

Patients of LWM group were 100% males, with mean age of 39.8±13.97 years and mean BMI of 27.65±4.2 kg/m^2, whereas the patients of HWM group were 90% males and 10% females, with mean age of 44.6±16.34 years and mean BMI of 28.06±3.4 kg/m^2. There is no statistically significant difference between LWM group and HWM group regarding patients' demographics, including sex, age, and BMI.

Smoking and comorbidities

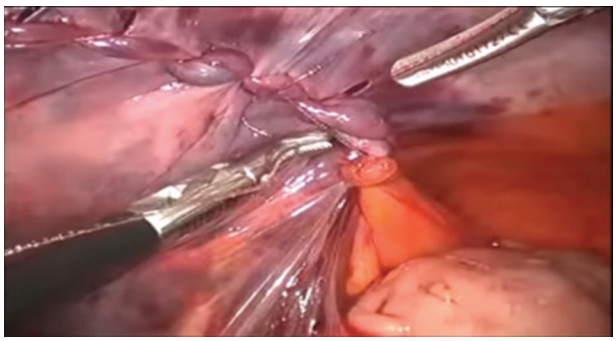
In the LWM group, 100% of patients were smokers, 40% of patients were diabetics, 30% of patients were hypertensives, and no cardiac patients, whereas in the

Figure 4



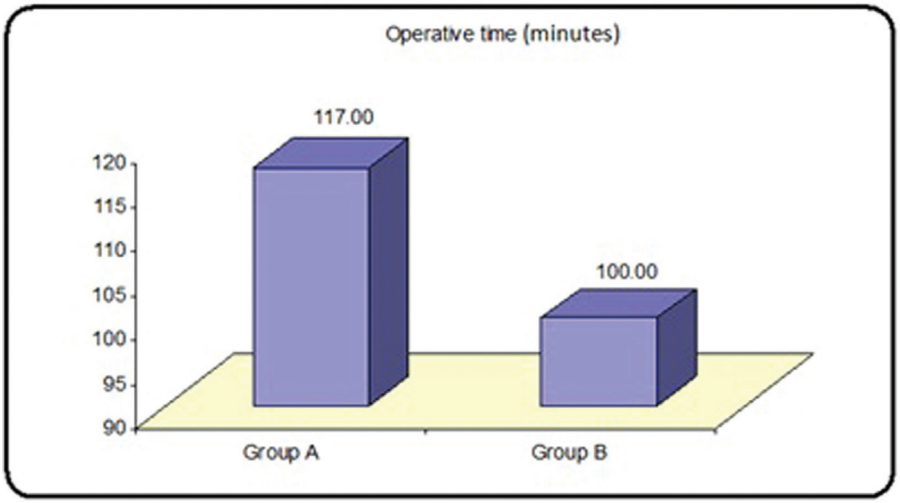
Fixation of mesh using nonabsorbable sutures.

Figure 5



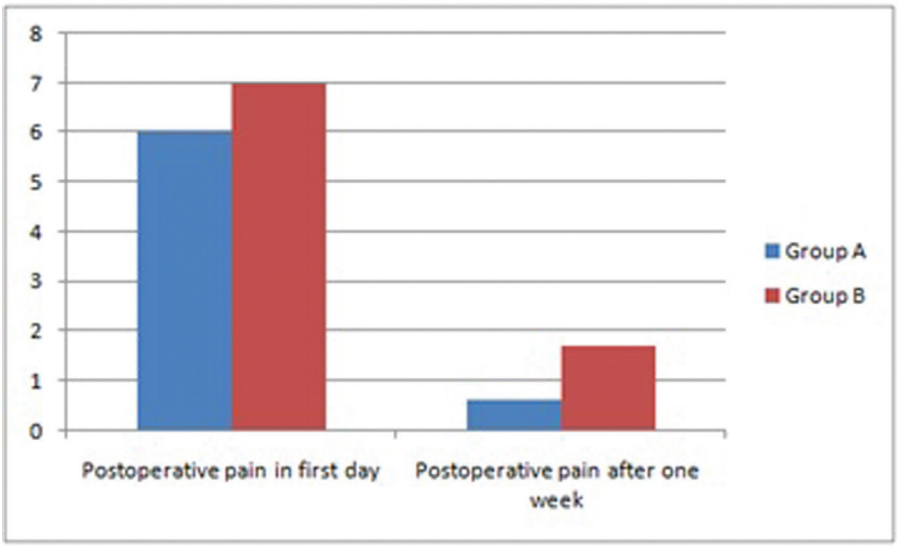
Closure of peritoneal flaps by nonabsorbable sutures.

Figure 6



Operative time in both groups.

Figure 7



Postoperative pain in both groups.

HWM group, 70% of patients were smokers, 30% of patients were diabetics, 30% of patients were hypertensives, and 10% of patients had cardiac disease. There were no patients with hepatic, renal, or other comorbidities in both groups. There is no statistically significant difference between LWM group and HWM group regarding prevalence of smoking and comorbidities.

History of previous abdominal surgeries

In the LWM group, 20% of patients have history of previous abdominal surgeries, whereas in the HWM group, 40% of patients have history of previous abdominal surgeries, with no statistically significant difference between both groups.

Hernia characteristics

In the LWM group, 10% of patients were complaining of direct inguinal hernia, whereas 90% of patients were complaining of indirect inguinal hernia; 30% of patients were complaining of left side hernia, whereas 70% of patients were complaining of right side hernia; and the median duration of complaint with inguinal hernia was 13.5 months (range: 6–30 months). However, in the HWM group, 20% of patients were complaining of direct inguinal hernia, whereas 80% of patients were complaining of indirect inguinal hernia; 30% of patients were complaining of left side hernia, whereas 70% of patients were complaining of right side hernia, and the median duration of complaint with inguinal hernia was 11 months (range: 5–60 months).

There is no statistically significant difference between the LWM group and the HWM group regarding hernia characteristics: type (direct or indirect), side (right or left), and duration of complaint.

Operative time

In the LWM group, the mean operative time was 117 ±7.53 min, whereas in the HWM group, the mean operative time was shorter (100±6.67 min), with statistically highly significant difference ($P<0.01$).

Postoperative pain

There was a statistically highly significant difference between the LWM group and the HWM group regarding postoperative pain in the first postoperative day and postoperative pain after 1 week ($P<0.01$).

In the first postoperative day, the mean pain score was 6 ±0.67 in the LWM group, whereas the mean pain score in the first postoperative day was higher, in HWM group (7±0.82) on NRS.

After 1 week, the mean pain score after 1 week was 0.6 ±0.7 in the LWM group, whereas the mean pain score after 1 week was higher in HWM group (1.7±0.82) on NRS.

Time to return to routine activity

In the LWM group, the mean time needed by the patients to return to routine nonweight bearing activity was 38.4±12.39 h, whereas in HWM group, the mean time needed by the patients to return to routine nonweight bearing activity was longer (67.2±10.12 h). There was a statistically highly significant difference between both groups ($P<0.01$).

Chronic pain

There was no statistically significant difference between the LWM group and the HWM group regarding experiencing chronic pain in the inguinal region 1 and 6 month after surgery.

After 1 month, there was one patient in LWM group who had chronic groin pain, while there were five patients in HWM group, but still no significant difference ($P>0.05$).

After 6 months, there was one patient in the LWM group who had chronic groin pain, whereas there were four patients in the HWM group, but still there was no significant difference ($P>0.05$).

Postoperative complications

In the LWM group, 10% of patients developed seroma, whereas in HWM group, 30% of patients developed seroma, with no statistically significant difference. They were successfully managed conservatively.

There was no patient who developed mesh infection or hernia recurrence during the 6-month follow-up.

Discussion

The demographic data and clinical profiles of patients in the LWM group and the HWM group were comparable.

In this study, the mean operative time was higher in the LWM group than in the HWM group, with statistically highly significant difference. In contrary to our results, Prakash *et al.* [14], Eskandaros and Hegab [15], and Bangash *et al.* [16] showed that there was no statistically significant difference.

In this study, the mean score of postoperative pain in the first postoperative day and after 1 week was lower in the LWM group than in the HWM group, with statistically highly significant difference. The same results were showed by Eskandaros and Hegab [15]. However, Prakash *et al.* [14] and Currie *et al.* [17] showed that there is no significant difference.

In this study, patients of the LWM group took significantly shorter time to return to routine daily activities than the HWM group. The same results were showed by Eskandaros and Hegab [15], whereas Prakash *et al.* [14] showed no statistically significant difference.

Our study showed that there was no statistically significant difference between the two groups in the incidence of chronic groin pain at 1 and 6 months. In agreement of our results, Prakash *et al.* [14] and Currie *et al.* [17] showed there is no significant difference. However, Eskandaros and Hegab [15] and Bangash *et al.* [16] showed that there is a significant difference between both groups. Regarding seroma formation, our study showed that the LWM group showed less incidence of seroma formation (10%) than the HWM group (30%), but still there was no statistically significant difference between both groups. The same results were obtained by Eskandaros and Hegab [15], Currie *et al.* [17], Prakash *et al.* [14], and Bangash *et al.* [16].

In this study, no patient developed mesh infection or need for mesh replacement in both the LWM and the HWM groups after 6 months of follow-up, and so was found by Prakash *et al.* [14] and Eskandaros and Hegab [15]. Bangash *et al.* [16] found that no patient has developed mesh infection in the HWM group, but there were two patients in the LWM group who has developed mesh infection, but with no statistically significant difference.

During 6 months of follow-up, our study showed that no hernia recurrence was recorded in both groups. Eskandaros and Hegab [15], Bangash *et al.* [16], and Currie *et al.* [17] found the same result, as there was no statistically significant difference between the LWM group and the HWM group regarding hernia recurrence.

We found in our study that the HWM was easier to be handled by the surgeon and hence had easier deployment and fixation, and hence shorter operative time. However, the LWM was accompanied with less postoperative inflammatory reaction, may be as it is partially absorbable, and hence less postoperative pain and early return to routine daily activities.

We found that newer LWM did not overweigh standard HWM in long-term complications after a 6-month follow-up, including chronic pain, seroma formation, mesh infection, and hernia recurrence.

Conclusion

In laparoscopic TAPP repair of unilateral uncomplicated inguinal hernia, use of partially absorbable LWM is superior to the use of nonabsorbable HWM regarding postoperative pain and time needed to return to routine daily activities, but was accompanied with longer operative time. Both LWM and HWM had comparable results regarding chronic pain, seroma formation, mesh infection, and hernia recurrence.

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Conflicts of interest

There are no conflicts of interest.

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