Original Article

Comparison of Lightweight and Heavyweight Prosthetic Mesh for Lichtenstein Repair of Inguinal Hernia

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ABSTRACT

Objective: To compare outcomes of lightweight mesh (LWM) versus heavyweight mesh (HWM) in inguinal hernia repair.

Methodology: It was a quasi-experimental study done at the General Surgery Department of Federal Government Polyclinic Hospital, Islamabad after ethical approval. One hundred and fifty six patients were enrolled using convenience sampling technique. Informed written consent was taken from the patients and they were divided into two groups, I and II. All patients had a Lichtenstein tension-free mesh repair. Patients in group I received HWM, whereas, those in group II received LWM. Then patients were followed-up on 1st day, 2nd week, 1st, 3rd, and 6th month post-surgery.

Results: Patients with LWM had significantly shorter operative and mesh fixation times than those with HWM. The postoperative pain and time to return to routine activity were also statistically reduced in patients with LWM (p-value <0.001). The mean hospital stay was not significantly different between the HWM and LWM groups (p-value=0.67). The postoperative complications were not linked to the mesh type except for foreign body sensation (p-value=0.02).

Conclusion: In the Lichtenstein method of inguinal hernia repair, the use of the lightweight mesh is better than the heavyweight mesh. It is associated with shorter operating time, less postoperative pain & foreign body sensation, and early recovery of the patients.

Keywords: *Inguinal hernia. Surgical mesh. Postoperative pain.*

INTRODUCTION

The inguinal hernia is a commonly encountered pathology in General Surgery. It affects 220 million individuals across the world and its frequency ranges from 1-31%.[1] It is responsible for 40,000 deaths and 3500,000 disability-adjusted life years.[2] Globally, more than 20 million inguinal hernia procedures are done each year.[1] Males have a 27.2% chance of acquiring inguinal hernia, while females have a risk of 2.6%.[3] Other predisposing factors of the disease are old age, low body mass index, abdominal wall weakness, high intra-abdominal pressure, smoking, jumping, coughing, and heavy weight lifting.[4]

The hernia repair has adopted various changes in recent years. Nowadays, the preferred technique is tension-free mesh repair, which is quickly replacing traditional suture repair (TSR). This is explained by numerous studies showing that mesh repair has lower recurrence rates than TSR. The surgical mesh provides firm reinforcement to the weakened area and facilitates collagen deposition.[5] A variety of meshes are available in the market. There are three types of mesh; light, medium, and heavyweight. Lightweight mesh has less weight and large pores. In contrast, heavyweight mesh has more weight and small pores. Controversy exists regarding the use of a mesh with the best results and lesser complications.[6] The complications of mesh repair include shrinkage, fistula, pain, infection, foreign body sensation, and recurrence. The most frequent issue following inguinal hernia repair is acute and long-lasting inguinal pain.[7] Around 10% of the individuals present with increased pain after surgery. This is attributed to poor quality of life interfering with the patient's work and social life. The majority of these complications occur with HWM.[8] Heavyweight prosthetic mesh induces a strong inflammatory response in the body, leading to pain and discomfort. Nowadays, lightweight proline mesh has been introduced which is inert, less dense, more flexible, partially absorbable, and has improved mechanical strength. It is associated with better tissue incorporation and less postoperative pain or discomfort.[9]

Our study was designed to compare the outcomes of LWM versus HWM in inguinal hernia repair and its effectiveness in improving the quality of life of patients after surgery. Literature has revealed that LWM is related to early pain relief and recovery of patients. The studies observing all surgical outcomes conducted in Pakistan are inadequate. Our study determined not only pain score but also other parameters such as operative time, mesh fixation time, hospital stay, return to routine activity, and postoperative complications. This study will contribute to improve the long-term goals of patient care, well-being, and health in surgical cases of inguinal hernia.

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METHODOLOGY

It was a quasi-experimental study done at the General Surgery Department of Federal Government Polyclinic Hospital, Islamabad. After taking ethical approval, the study was conducted from January to June 2020. One hundred and fifty six patients were enrolled using convenience sampling technique. Male patients with age ≥18 years having a primary and reducible inguinal hernia were included. The exclusion criteria were females, patients with strangulated or recurring hernia, chronic ailment, or concurrent infections. Informed written consent was taken from the patients and they were divided into two groups, I and II with 78 patients in each group. All patients had a Lichtenstein tension-free mesh repair. Patients in group I received HWM, whereas those in group II received LWM.

The heavyweight mesh used was non-soluble, monofilament with smaller apertures, and weighing 80-85 g/m^2. Lightweight mesh was a monocryl, captivated within 90-120 days due to hydrolysis leaving a mesh with a pore size of 3-4 mm and weighing 28 g/m^2. Demographic data was recorded on predesigned proforma. Patients were then operated in spinal anesthesia on the available elective list and a sufficient overlap was achieved using a 6x11 cm mesh. Patients were followed-up on 1st day, 2nd week, 1st, 3rd, and 6th month post-surgery. The outcomes assessed were operative time, mesh fixation time, duration of hospital stay, postoperative pain (both acute and chronic), and return to routine activity. Pain that lasts for 3 months is taken as acute and pain that persists for >3 months is labeled as chronic. The pain was assessed by visual analog score. It has a total of 10 points ranging from 0 ("painless") to 10 ("excruciating pain"). The incidence of postoperative complications was also noted in both groups.

STATISTICAL ANALYSIS

The entire patient information was recorded and analyzed in the Statistical Package for the Social Sciences (SPSS) version 25. The mean with standard deviation (SD) was estimated for numeric parameters such as age and pain scores. For categorical parameters, frequency and percentages were shown. The outcomes were compared between the two groups. An independent sample t-test was used for numeric data and a Chi-square test was applied for categorical data. For comparing postoperative pain between study groups at different time intervals, repeat measure ANOVA was used. A p-value of ≤0.05 was considered significant.

RESULTS

The average age of the patients was 46.21±17.07 years, with the youngest patient being 18 years old and the oldest patient being 90 years old. All the study participants were males. Group I had a mean age of 48.91±18.58 years, while group II had a mean age of 45.51±15.05 years (p-value=0.21). The right inguinal hernia was noted in 90(57.7%) patients followed by a left inguinal hernia in 58(37.2%) patients and bilateral inguinal hernia in 8(5.1%) patients.

Patients with LWM had significantly shorter operative and mesh fixation times than those with HWM. The mean hospital stay was not significantly different between the HWM and LWM groups (p-value=0.67). The postoperative pain was statistically reduced in patients with LWM at all the follow-ups (p-value=0.001). Similarly, the patients with LWM returned to routine activity earlier than those with HWM (p-value <0.001) (Table 1). Postoperative pain in study groups is shown in Figure 1.

The postoperative complications were not linked to the mesh type except for foreign body sensation (p-value=0.02). Foreign body sensation was reported in 5 patients and all of them were in group I. Recurrence was absent in both groups (Table 2).

DISCUSSION

Mesh repair, particularly the Lichtenstein technique, is the recommended treatment option for inguinal hernia. However, it is linked with the complications of chronic pain, wound infection, foreign body sensation, and recurrence.[10] To overcome this issue, different types of mesh have been synthesized. Literature has reported that LWM is associated with less complication than HWM.[11] This may be due to the large quantity of foreign material in HWM leading to an excessive inflammatory response. In contrast, the large pores of LWM promote collagen deposition and mesh integration into the abdominal wall with less inflammation.[12]

In our study, patients with HWM had a mean age of 48.91±18.58 years, whereas the mean age in patients with LWM was 45.51±15.05 years. In another study, the mean age was 38±24 years and 37.5±22.5 years in the HWM and LWM groups, respectively.[13] In a study by Lee et al., the mean age was 64 years in both groups.[14] In another study, the mean age was 45.26±14.4 years in the LWM group and 45.55±17.7 years in the HWM group.[15] Our results showed that most of the patients had a right inguinal hernia [90(57.7%)], followed by a left inguinal hernia [58(37.2%)] and bilateral inguinal hernia [8(5.1%)]. Similarly, Lata et al. reported right inguinal hernia in 57.1%, left inguinal hernia in 32.1%, and bilateral inguinal hernia in 10.7% of the patients.[15]

According to our results, the mean operative time and mesh fixation time were statistically less in patients with lightweight mesh. Regarding the average hospital stay, it was between 1-4 days, with an average stay of

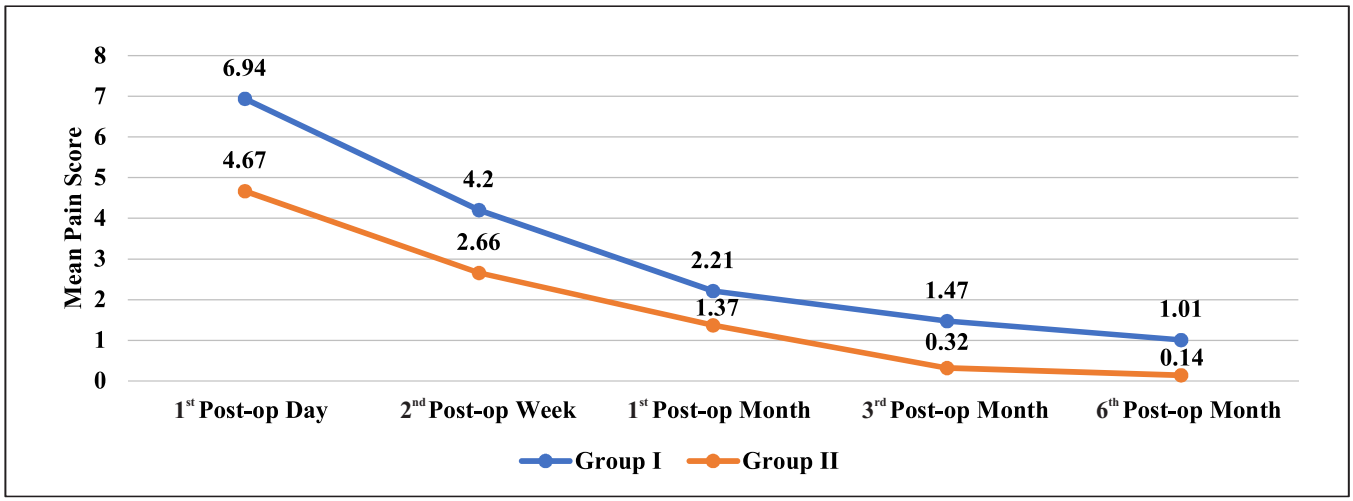

Figure 1: Comparison of Postoperative Pain in Study Groups

Table 1: Comparison of Outcomes between the Study Groups

Outcomes		Group I	Group II	p-value
		Mean±SD		
Operative Time (min)		61.3±12.55	53.5±13.05	0.0002*
Mesh Fixation Time (min)		14.25±3.65	13.05±3.9	0.04*
Hospital Stay (Days)		1.34±0.62	1.3±0.58	0.67
Postoperative Pain	**1st Day**	6.94±0.82	4.67±0.84	0.001*
	2nd Week	4.2±0.91	2.66±0.57	
	1st Month	2.21±0.41	1.37±0.66	
	3rd Month	1.47±0.59	0.32±0.54	
	6th Month	1.01±0.44	0.14 ± 0.35	
Time to Return to Routine Activity (Weeks)		2.88±1.25	1.82±0.54	<0.001*

**Significant p-value*

Table 2: Comparison of Postoperative Complications between the Study Groups

Postoperative Complications	Group I	Group II	p-value
	Frequency & Percentage		
Seroma	3(3.84%)	1(1.28%)	0.31
Hematoma	2(2.56%)	1(1.28%)	0.56
Wound Infection	1(1.28%)	1(1.28%)	1
Epididymo-Orchitis	1(1.28%)	0(0%)	0.31
Scrotal Edema	4(5.13%)	1(1.28%)	0.17
Foreign Body Sensation	5(6.41%)	0(0%)	0.02*

**Significant p-value*

1.34±0.62 days in patients with HWM and 1.3±0.58 days in LWM. This was not statistically significant. Similarly, the mean hospital stay did not statistically differ between the two groups in two other studies. They also found less operative & mesh fixation time in patients with lightweight mesh in their studies.[13,16] In a study by Verma et al., the mean length of stay was 8.6 days for patients with HWM and 5.6 days for patients with LWM.[17]

Our study showed a progressive decline in pain with time in both groups, whereas the reduction in pain was significantly more in group II, with an earlier return to normal activity. A study done at the Services Institute of Medical Sciences, Lahore supports our findings.[18] Other studies also found that patients with LWM had significantly less pain after surgery.[14,17] Sidharta et al. and Rutegard et al. also reported a statistical reduction in postoperative pain with LWM.[19,20]

A study showed no distinction in the pain scores between the two groups on initial follow-ups. However, at three months, patients with LWM had a significantly lower pain score than those with HWM.[16] In contrast, the pain score did not vary significantly between the two groups in a study.[21] A meta-analysis demonstrated a statistical reduction in pain after surgery with LWM than HWM.[22] Another study reported that patients in the lightweight mesh group returned to routine activities in less time as compared to patients in the HWM group.[13]

In our study, the postoperative complications were not linked to the mesh type except for foreign body sensation. Foreign body sensation was reported only in the patients of the HWM group. Lee et al. and Lata et al. revealed a significant difference in only foreign body sensation between the two groups, with a greater incidence in patients with heavyweight mesh.[14,15] Another study reported foreign body sensation in 15% of the patients with HWM and 10% of the patients with LWM.[17] According to a meta-analysis, light mesh is associated with a significant decrease in foreign body sensation.[22] In another study, the postoperative complications of seroma/hematoma formation, wound infection, recurrence, and foreign body sensation had no relation with the type of mesh. However, the incidence of epididymo-orchitis and scrotal edema was more in the HWM group, with statistical significance.[13] The results of another study revealed that seroma, wound infection, and recurrence rates were the same in both HWM and LWM groups.[19]

CONCLUSION

In the Lichtenstein method of inguinal hernia repair, the use of the lightweight mesh is better than the heavyweight mesh. It is associated with shorter operating time, less postoperative pain & foreign body sensation, and early recovery of the patients. So, LWM is a safe modality for Lichtenstein repair of inguinal hernia.

LIMITATIONS & RECOMMENDATIONS

It was a single-centered quasi-experimental study. A further multi-centered randomized controlled trial is recommended.

Conflict of Interest: None.
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REFERENCES

1. Sapiyeva ST, Abatov NT, Aliyakparov MT, Noso Y, Badyrov RM, Badyrova ES. Autoplasty by displaced aponeurotic flap: results of a new method of inguinal hernias surgical treatment. Open Access Maced J Med Sci. 2021; 9(B):48-54. doi:10.3889/oamjms.2021.5589.

2. Thet Lwin ZM, Forsberg B, Keel G, Beard JH, Amoako J, Ohene-Yeboah M, et al. Economic evaluation of expanding inguinal hernia repair among adult males in Ghana. PLOS Glob Public Health. 2022; 2(4):e0000270. doi:10.1371/journal.pgph.0000270.

3. Lindenbergh KC, van Duinen AJ, Ahlback JG, Kamoh J, Bah S, Ashley T, et al. Prevalence, incidence, repair rate, and morbidity of groin hernias in Sierra Leone: cross-sectional household study. BJS Open. 2023; 7(1):zrac158. doi:10.1093/bjsopen/zrac158.

4. Abebe MS, Tareke AA, Alem A, Debebe W, Beyene A. Worldwide magnitude of inguinal hernia: systematic review and meta-analysis of population-based studies. SAGE Open Med. 2022; 10:20503121221139150. doi:10.1177/20503121221139150.

5. Vineeth S, Sudarshan PB, Selvam A, Gowtham D, Reddy B. Laparoscopic management of inguinal hernia by TEP technique - a single institution experience. Surg Clin J. 2022; 3(1):1044. Available from: https://www.medtextpublications.com/open-access/laparoscopic-management-of-inguinal-hernia-by-tep-technique-a-999.pdf.

6. Deveci CD, Oberg S, Rosenberg J. Definition of mesh weight and pore size in groin hernia repair: a systematic scoping review of randomised controlled trials. J Abdom Wall Surg. 2023; 2:11179. doi:10.3389/jaws.2023.11179.

7. HerniaSurge Group. International guidelines for groin hernia management. Hernia. 2018; 22(1):1-165. doi:10.1007/s10029-017-1668-x.

8. Iftikhar N, Kerawala A. Quality of life after inguinal hernia repair. Pol Przegl Chir. 2021; 93(3):1-5. doi:10. 5604/01.3001.0014.8218.

9. Sanbhal N, Miao L, Xu R, Khatri A, Wang L. Physical structure and mechanical properties of knitted hernia mesh materials: a review. J Ind Text. 2018; 48(1):333-60. doi:10.1177/1528083717690613.

10. Neogi P, Gupta V, Tripathi N. A comparative study of outcomes of Lichtenstein repair and Desarda tissue repair in patients of inguinal hernia. Int Surg J. 2017; 4(8):2693-9. doi:10.18203/2349-2902.isj20173407.

11. Krauß M, Heinzel-Gutenbrunner M, Kronung L, Hanisch E, Buia A. Comparing large pore lightweight mesh versus small pore heavyweight mesh in open mesh plug repair of primary and recurrent unilateral inguinal hernia - a questionnaire study for a retrospective analysis of a cohort of elective groin hernia patients using propensity score matching. Int J Surg. 2020; 75:93-98. doi:10.1016/j.ijsu.2020.01.130.

12. Ibrahim MM, Abd Alaaty WR, Abd Alkader OI. Comparative study between heavy-weight mesh and light-weight mesh in ventral hernia repair. EJHM. 2019; 76(2):3556-63. doi:10.21608/EJHM.2019.39161.

13. Khalil MRI, El-Shafey MH, Lasheen AMA. Comparative study between lightweight meshes versus traditional heavyweight meshes for the repair of inguinal hernia. EJHM. 2019; 74(3):669-78. doi:10. 21608/EJHM.2019.23798.

14. Lee SD, Son T, Lee JB, Chang YS. Comparison of partially-absorbable lightweight mesh with heavyweight mesh for inguinal hernia repair: multicenter randomized study. Ann Surg Treat Res. 2017; 93(6):322-30. doi:10. 4174/astr.2017 .93.6.322.

15. Lata, Bhuvan, Bisht N, Alok S. A randomized clinical trial comparing outcomes of Lichtenstein hernia repair with lightweight vs. heavyweight mesh. Int J Acad Med Pharm. 2023; 5(3):2144-8. doi:10.47009/jamp.2023. 5.3.422.

16. Kumar R, Saxena N, Kundan M, Sharma A, Vijaylakshmi. Lightweight mesh versus heavyweight mesh in open Lichtenstein hernioplasty: a prospective randomized study. IOSR-JDMS. 2021; 20(3):50-4. doi:10.9790/0853-20030 65054.

17. Verma VK, Gangji A, Chandel H. Comparison of outcome between lightweight mesh v/s heavyweight mesh in Lichtenstein hernia repair. JMSCR. 2019; 7(1):849-53. doi:10. 18535/jmscr/v7i1.150.

18. Awais M, Rafi O, Naeem S, Waheed A, Khan R, Rooh-Ul-Ain, et al. Comparison of mean postoperative inguinodynia in patients undergoing open inguinal hernia surgery with use of standard polypropylene heavyweight mesh v/s ultra pro lightweight mesh. PJMHS. 2022; 16(6):173-5. doi:10.53350/ pjmhs22166173.

19. Sidharta NA, Irawan A, Siregar JI, Hardjo Lugito NP. Comparison of early postoperative pain between lightweight mesh and heavyweight mesh in Lichtenstein hernia repair for geriatric patients at Rumah Sakit Siloam Karawaci from January 2018 - December 2019. Medicinus. 2022; 10(1):10-5. doi:10.19166/med.v10i1. 6989.

20. Rutegard M, Lindqvist M, Svensson J, Nordin P, Haapamaki MM. Chronic pain after open inguinal hernia repair: expertise-based randomized clinical trial of heavyweight or lightweight mesh. Br J Surg. 2021; 108(2):138-44. doi:10.1093/bjs/ znaa049.

21. Srinivas NM, Shetty KK. Light vs heavyweight mesh in Lichtenstein's open inguinal hernia repair: a prospective study. Int J Surg Sci. 2019; 3(1):12-5. doi:10.33545/surgery.2019. v3.i1a.05.

22. Bakker WJ, Aufenacker TJ, Boschman JS, Burgmans JPJ. Lightweight mesh is recommended in open inguinal (Lichtenstein) hernia repair: a systematic review and meta-analysis. Surgery. 2020; 167(3):581-9. doi:10.1016/j.surg. 2019.08.021.