Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.2705

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Complications of Ventral Hernia Repair: Small Pore Polypropylene Mesh Versus Large Pore Polypropylene Mesh

Omar Farooq Chaudrie[1], Col. Muhammad Younus Awan[2]

[1,2]Department of Surgery, CMH, Lahore, Punjab, Pakistan.

ARTICLE INFO

Keywords: Light Weight Mesh, Pain, Ventral Hernia.

Correspondence to: Omar Farooq Chaudrie,
Department of Surgery, CMH, Lahore, Punjab, Pakistan.
Email: finalyatwork@gmail.com

Declaration
Authors' Contribution
Both authors equally contributed to the study and approved the final manuscript

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 07-03-2025 Revised: 01-05-2025
Accepted: 18-05-2025 Published: 30-05-2025

ABSTRACT

Objective: To compare the outcome between large pore mesh and small pore mesh in ventral hernia repair. **Settings:** Department of General Surgery, CMH, Lahore. **Study type:** Randomized Controlled Trial. **Study Duration:** July 2024 to December 2024. **Materials & Methods:** 132 adults between the ages of 20 and 60 who had ventral hernias were included. Patients with advanced renal and hepatic disease, neurological or behavioral disorders, unstable cardiovascular conditions, cancer, and long-term steroid use that can impede wound healing were not included. Patients in Group 1 were utilizing large pore mesh to repair hernias. Patients in Group 2 were using small pore mesh to repair hernias. The patients were released from the hospital 24 hours after the procedure. Every two weeks, the patients were monitored. Outcome in the form of pain and foreign body sensation after four weeks (yes/no). **Results:** Patients in groups 1 and 2 had mean ages of 40.77 ± 9.27 and 39.70 ± 9.91 years, respectively. With a male to female ratio of 1:1.1, 64 (48.48%) and 68 (51.52%) of the 132 patients were male. In my research, 31.82% of instances with heavy mesh and 16.67% of cases with light mesh experienced alien body sensation. 22.73% of the heavy mesh group had pain, compared to 10.61% in the light mesh group. **Conclusion:** This study concluded that light weight mesh causes less pain and foreign body sensation as compared to the heavy weight mesh.

INTRODUCTION

A protrusion of abdominal viscera from a weakening in the abdominal wall muscles is known as an abdominal wall hernia.[1] A defect in the musculofascial layers of the abdominal wall in the area of the postoperative scar is known as a ventral abdominal wall incisional hernia. According to global literature, the incidence of incisional hernia is 2–11% and in certain series, 10–20%.[2] Ventral hernias can be categorized by their location on the abdominal wall, whether they are acquired (secondary) or spontaneous (primary). Umbilical, paraumbilical, epigastric, and spegelian hernias are other classifications for primary ventral hernias. Either an open or laparoscopic technique is used to correct the ventral hernia.[3]

In order to stabilize the abdominal wall and stop the hernia from recurring, an incision is made in the abdomen, the muscles of the abdominal wall are reinforced with stitches, and synthetic or biologic mesh is placed between the muscles and fascia.[4] The tensile strength of polypropylene meshes is significantly higher than what is needed physiologically.[5] A lighter mesh is produced by increasing the pore size while decreasing the amount of polypropylene. By adding an absorbable component to a reduced mass of polypropylene, large-pore composite meshes are created, which improves their functional qualities and may lessen mesh-related complications.[6] The literature relies on a wealth of experimental data relating to different mesh types, and mesh reinforcement in hernia repair is widely acknowledged, but high-quality RCTs reporting surgical and patient-related results on diverse meshes are still needed.[7,8]

The study's objective was to assess the effects of large pores versus small pores mesh on patients undergoing ventral hernia surgery in our local environment in terms of chronic pain, foreign body sensation, and return to daily normal activities. The study's findings will demonstrate the superiority of one mesh over another, allowing surgeons to choose a better approach for repairing ventral hernias while taking local literature results into consideration. This will enhance these patients' quality of life and reduce their pain-related morbidity.

METHODOLOGY

With consent from the ethical review committee, this randomized controlled trial investigation was carried out in the surgical department of the CMH in Lahore between July and December 2025. Using the formula for hypothesis testing for differences between two population

proportions, the WHO sample size calculator determines the sample size. The study's power was 80%, the level of significance was α = 5%, and the frequency of discomfort after one month was 10% in the big pore mesh group and 26.7% in the tiny pore mesh group. 132 is the sample size (66 in each group).[9] The study comprised patients of both sexes who were diagnosed with ventral abdominal hernia (protrusion of abdominal viscera through defect in the musculofascial layers of the abdominal wall) and ranged in age from 18 to 60. Patients with advanced renal and hepatic disease, neurological or behavioral disorders, unstable cardiovascular conditions, cancer, and long-term steroids that can impede wound healing were not included.

Age (years), gender (male/female), hernia length (months), hernia side (right/left), and obesity (yes/no) were recorded as baseline characteristics. Using the lottery approach, each recruited participant was assigned at random to either group 1 or 2. Participants picked up opaque, sealed envelopes that contained slips belonging to either group 1 or group 2. Patients in Group 1 were utilizing large pore mesh to repair hernias. Patients in Group 2 were using small pore mesh to repair hernias. In every instance, the usual Lichtenstein hernia repair procedure was used. A consultant surgeon carried out each surgery. The patients were released from the hospital 24 hours after the procedure. Every two weeks, the patients were monitored. Four weeks later, the result was agony and a yes/no feeling of a foreign body. Every piece of information was recorded on the study's proforma.

SPSS version 25.0 was used to analyze the data. The mean ± SD were used to display age and hernia duration. Frequency and percentage were used to display gender, obesity, and outcomes in the form of discomfort and foreign body sensation (yes/no) at the 4-week follow-up. The results in both groups were compared using the chi square test, and a p-value of less than 0.05 was deemed significant. Stratification was used to control effect modifiers such as age groups, gender, obesity, and length of hernia, and post-stratification chi square was used to examine their impact on outcomes between two groups. A p-value of less than 0.05 was deemed significant.

RESULTS

The study's age range was 20 to 60 years old, with a mean age of 40.55 ± 9.64 years. Patients in groups 1 and 2 had mean ages of 40.77 ± 9.27 and 39.70 ± 9.91 years, respectively. Eighty-two (62.12%) of the patients were in the 41–60 age range. With a male to female ratio of 1:1.1, 64 (48.48%) and 68 (51.52%) of the 132 patients were male. The illness lasted 8.74 ± 3.61 months on average. In group 1, the average length of illness was 9.23 ± 3.68 months, while in group 2, it was 8.50 ± 3.57 months. Table I displays the distribution of patients by level of obesity.

In our research, 31.82% of instances with heavy mesh and 16.67% of cases with light mesh experienced alien body sensation. According to Table II, 22.73% of the heavy mesh group had pain, compared to 10.61% in the light mesh group. Tables III and IV, respectively, present the stratification of pain and foreign body sensation by age groups, gender, obesity, hernia duration, and hernia side.

Table I

Distribution of different variables (n=132).

		Group 1 (n=66)	Group 2 (n=66)
		Number (%)	Number (%)
Age (years)	20-40	22 (33.33%)	28 (42.42%)
	41-60	44 (66.67%)	38 (57.58%)
Gender	Male	31 (46.97%)	33 (50.0%)
	Female	35 (53.03%)	33 (50.0%)
Duration of hernia (months)	≤12 months	53 (80.30%)	58 (87.88%)
	>12 months	13 (19.70%)	08 (12.12%)
Obesity	Yes	22 (33.33%)	25 (37.88%)
	No	44 (66.67%)	41 (62.12%)

Table II

Comparison of the outcome between light-weight mesh and heavy-weight mesh in inguinal hernia repair.

Outcome	Group 1 (n=66)		Group 2 (n=66)		p-value
	Yes	No	Yes	No	
Pain	07 (10.61%)	59 (89.39%)	15 (22.73%)	51 (77.27%)	0.062
Foreign body sensation	11 (16.67%)	55 (83.33%)	21 (31.82%)	45 (68.18%)	0.042

Table III

Stratification of pain with respect to age groups, gender, obesity, duration of hernia and side of hernia.

		Group 1 (n=66) Pain		Group 2 (n=66) Pain		P-value
		Yes	No	Yes	No	
Age (years)	20-40	03 (13.64%)	19 (86.36%)	07 (25.0%)	21 (75.0%)	**0.319**
	41-60	04 (9.09%)	40 (90.91%)	08 (21.05%)	30 (78.95%)	**0.127**
Gender	Male	02 (6.45%)	29 (93.55%)	05 (15.15%)	28 (84.85%)	**0.265**
	Female	05 (14.29%)	30 (85.71%)	10 (30.30%)	23 (69.70%)	**0.1114**
Duration (months)	≤12	07 (13.21%)	46 (86.79%)	11 (18.97%)	47 (81.03%)	**0.411**
	>12	00 (0.0%)	13 (100.0%)	04 (50.0%)	04 (50.0%)	**0.005**
Obesity	Yes	05 (22.73%)	17 (77.27%)	09 (36.0%)	16 (64.0%)	**0.321**
	No	02 (5.55%)	42 (95.45%)	06 (14.63%)	35 (85.37%)	**0.111**

Table IV

Stratification of foreign body sensation with respect to age groups, gender, obesity, duration of hernia and side of hernia.

		Group 1 (n=66) foreign body sensation		Group 2 (n=66) foreign body sensation		P-value
		Yes	No	Yes	No	
Age (years)	20-40	04 (18.18%)	18 (81.82%)	10 (35.71%)	18 (64.29%)	**0.171**
	41-60	07 (15.91%)	37 (84.09%)	11 (28.95%)	27 (71.05%)	**0.155**
Gender	Male	04 (12.90%)	27 (87.10%)	08 (24.24%)	25 (75.76%)	**0.245**

	Female	07 (20.0%)	28 (80.0%)	13 (39.39%)	20 (60.61%)	**0.079**
Duration (months)	≤12	10 (18.87%)	43 (81.13%)	20 (34.48%)	38 (65.52%)	**0.064**
	>12	01 (7.69%)	12 (92.31%)	01 (12.50%)	07 (87.50%)	**0.716**
Obesity	Yes	04 (18.18%)	18 (81.82%)	10 (40.0%)	15 (60.0%)	**0.103**
	No	07 (15.91%)	37 (84.09%)	11 (26.83%)	30 (73.17%)	**0.218**

DISCUSSION

Mesh should typically be robust enough to permanently hide the flaw. As a result, nonabsorbable meshes composed of monofilaments including nylon, polyester, polypropylene, and Teflon have been employed. Because of its superior adhesiveness and persistence, polypropylene monofilament mesh is one of the most popular of these. However, because to its hefty weight (about 100 g/m2) and nonabsorbability, polypropylene mesh has a number of issues, including mesh-induced discomfort and stiffness. Furthermore, the scar neo-tissue has much greater collagen type I/III ratios and immature collagen deposition due to the severe inflammation caused by polypropylene meshes.[10] Additionally, it may result in a chronic inflammatory response and fistula. Therefore, new mesh products that reduce these issues are required. Large-pore monofilament meshes show less connective tissue, scar bridging, and inflammatory infiltration, allowing for greater soft tissue ingrowth.[11] A new kind of lightweight mesh for inguinal hernias was recently launched. It is made of polypropylene and absorbable poliglecaprone threads, which reduces stiffness and pain without sacrificing the necessary resistance to cover the hernia defect.

The purpose of this study is to compare the results of ventral hernia repair using big pore mesh against small pore mesh. The study's age range was 20 to 60 years old, with a mean age of 40.55 ± 9.64 years. Patients in groups 1 and 2 had mean ages of 40.77 ± 9.27 and 39.70 ± 9.91 years, respectively. Eighty-two (62.12%) of the patients were in the 41–60 age range. With a male to female ratio of 1:1.1, 64 (48.48%) and 68 (51.52%) of the 132 patients were male. In my research, 31.82% of instances with heavy mesh and 16.67% of cases with light mesh experienced alien body sensation. Pain was reported in 22.73% of the heavy mesh group and 10.61% of the low mesh group. In 60 patients with inguinal hernias, Nasiruddin S. et al. compared lightweight and heavyweight mesh. At the one-month mark, 13.3% of cases with light mesh and 30% of cases with heavy mesh had a foreign body experience. At the one-month follow-up, 26.7% of the heavy mesh group and 10% of the light mesh group reported having pain. Ten percent of patients in the heavy mesh group reported having stiffness throughout their abdominal wall, compared to none in the light mesh group.[9]

According to a study[12], 25% of patients in both groups had some degree of pain at 6 months, with 1% reporting severe pain. Multivariable analysis showed that lightweight mesh was better for pain at one week and six months after surgery (p = 0.02 and p = 0.04, respectively) and for quality of life at one month and six months (p = 0.05 and p = 0.02, respectively). No hernia recurrences were observed, and the complication rate remained unchanged. Using lightweight mesh instead of heavyweight mesh for anterior Lichtenstein inguinal hernia repair greatly reduced the amount of pain and improved the perceived quality of life six months after surgery.[12]

A prospective, clinical, randomized, controlled study[13] involved the correction of fifty bilateral TEP hernias. Three months following the procedure, six patients (12%) reported persistent pain. The side of the hernia that was treated with heavyweight mesh had a higher average pain score than the side that was patched with lightweight mesh. However, this difference was not statistically significant. More patients reported a foreign body sensation on the side mended with heavyweight mesh (24%) compared to the side treated with lightweight mesh (8%; P < 0.05). Neither type of mesh necessitated reintervention or recurrence.[13]

In a different study, O'Dwyer et al. compared the discomfort experienced by individuals who had inguinal hernia surgery using absorbable lightweight mesh versus non-absorbable heavy-weight mesh at one, three, and twelve months. Of the 132 patients they examined, 162 had light-weight mesh treatment and 159 received heavy-weight mesh treatment. Compared to heavy-weight mesh (51.6%), fewer patients experienced severe pain following absorbable light-weight mesh repair (39.5%).[14]

In their study conducted in Warsaw, Poland, Pielaciński K. et al.[15] noted that while tension-free surgical methods for inguinal hernia repair have improved outcomes and significantly decreased hernia recurrence, these methods are not without hazards. Chronic discomfort in the operated groin is the most prevalent and unsolved clinical issue. The nature and existence of the mesh is one of the probable causes that are considered. According to research findings, scar tissue formation is significantly influenced by the quantity and composition of the implanted material. Compared to light propylene or partially absorbable meshes, heavy propylene non-absorbable meshes result in a more severe inflammatory response and the production of scars. Clinical experiments with comparatively short follow-up periods validated the suggested superiority of light meshes.[15]

70 male patients with inguinal hernias, 35 in each group, participated in a study.[16] Patients in HWM and LWM had mean ages of 54.11 (40-75) and 50.71 (40-66) years, respectively (p >0.05). Patients' weight and height differences between the two groups were not statistically significant (p >0.05). In both groups, there was no statistically significant difference in the time between the hernia's occurrence and operation (15 months vs. 14.14 months). The Visual Analogue Scale was used to measure post-operative pain. At 12 hours, the pain scores were determined. 24 hours, the seventh day, one month, and six months. The pain scores at 12 hours, 24 hours, 7 days, and 1 month did not differ statistically significantly. At six months following surgery, however, there was a statistically significant difference between the HWM and LWM groups' mean pain scores (VAS) (0.83 vs. 0.34) p < 0.05.[16]

Nonetheless, a number of research have shown contradictory findings. While some research found no change in pain scores, other investigations found that using lightweight meshes had negative effects.[17,18] Because the inflammatory response lasts for three months after surgery, a study predicted that the enhanced fibrotic reaction from the use of heavy weight meshes would be followed by a higher frequency of persistent pain and postoperative fibrotic alteration, which may cause discomfort later.[19] Lightweight meshes were linked to an equal prevalence of mesh awareness and discomfort, a higher frequency of persistent pain, and an increased chance of recurrence, according to another recent study.[20,21]

CONCLUSION

According to the study's findings, compared to tiny hole mesh, large pore mesh results in reduced pain and foreign body sensation. Therefore, we advise frequent use of large pore mesh for ventral hernia repair in order to minimize post-operative pain, which will enhance patients' quality of life by lowering post-operative morbidity.

REFERENCES

1. Krpata, D. M., Petro, C. C., Prabhu, A. S., Tastaldi, L., Zolin, S., Fafaj, A., Rosenblatt, S., Poulose, B. K., Pierce, R. A., Warren, J. A., Carbonell, A. M., Goldblatt, M. I., Stewart, T. G., Olson, M. A., & Rosen, M. J. (2021). Effect of hernia mesh weights on postoperative patient-related and clinical outcomes after open ventral hernia repair. *JAMA Surgery*, *156*(12), 1085. https://doi.org/10.1001/jamasurg.2021.4309
2. Linn, J. G., Mallico, E. J., Doerhoff, C. R., Grantham, D. W., & Washington, R. G. (2022). Evaluation of long-term performance of an intraperitoneal biomaterial in the treatment of ventral hernias. *Surgical Endoscopy*, *37*(5), 3455-3462. https://doi.org/10.1007/s00464-022-09803-9
3. Ellis, R. C., Petro, C. C., Krpata, D. M., Beffa, L. R., Miller, B. T., Montelione, K. C., Maskal, S. M., Tu, C., Huang, L., Lau, B., Fafaj, A., Rosenblatt, S., Rosen, M. J., & Prabhu, A. S. (2023). Transfascial fixation vs no fixation for open Retromuscular ventral hernia repairs. *JAMA Surgery*, *158*(8), 789. https://doi.org/10.1001/jamasurg.2023.1786
4. Maskal, S., Miller, B., Ellis, R., Phillips, S., Prabhu, A., Beffa, L., Krpata, D., Rosenblatt, S., Rosen, M., & Petro, C. (2023). Mediumweight polypropylene mesh fractures after open retromuscular ventral hernia repair: Incidence and associated risk factors. *Surgical Endoscopy*, *37*(7), 5438-5443. https://doi.org/10.1007/s00464-023-10039-4
5. Fafaj, A., Beffa, L. R., Petro, C. C., Prabhu, A. S., Miller, B. T., Huang, L., Ellis, R. C., Maskal, S. M., Messer, N., Mazzola Poli de Figueiredo, S., & Rosen, M. J. (2025). Comparing short-term outcomes of ventral hernia repair using heavyweight non-woven polypropylene mesh with heavyweight knitted polypropylene mesh. *Journal of Abdominal Wall Surgery*, *4*. https://doi.org/10.3389/jaws.2025.14316
6. Coale, A. T., Wegener, A. M., Leavitt, J. D., Bovio, J. C., & Hope, W. W. (2025). Long-term outcomes of ventral hernia repair using a new prosthetic mesh. *International Journal of Abdominal Wall and Hernia Surgery*, *8*(1), 7-12. https://doi.org/10.4103/ijawhs.ijawhs_74_24
7. Spurzem, G. J., Broderick, R. C., Li, J. Z., Sandler, B. J., Horgan, S., & Jacobsen, G. R. (2024). Maximizing mesh mileage: Evaluating the long-term performance of a novel hybrid mesh for ventral hernia repair. *Hernia*, *28*(4), 1151-1159. https://doi.org/10.1007/s10029-024-02995-0
8. Wu, F., Zhang, X., Liu, Y., Cao, D., Yu, Y., & Ma, Y. (2019). Lightweight mesh versus heavyweight mesh for laparo-endoscopic inguinal hernia repair: A systematic review and meta-analysis. *Hernia*, *24*(1), 31-39. https://doi.org/10.1007/s10029-019-02016-5
9. Nasiruddin, S., Suresh, S., & H., J. D. (2017). A comparative study between light and heavy polypropylene mesh in Lichtenstein repair of inguinal hernia. *International Surgery Journal*, *4*(12), 3933. https://doi.org/10.18203/2349-2902.isj20175122
10. Simons, M. P., Aufenacker, T., Bay-Nielsen, M., Bouillot, J. L., Campanelli, G., Conze, J., De Lange, D., Fortelny, R., Heikkinen, T., Kingsnorth, A., Kukleta, J., Morales-Conde, S., Nordin, P., Schumpelick, V., Smedberg, S., Smietanski, M., Weber, G., & Miserez, M. (2009). European hernia society guidelines on the treatment of inguinal hernia in adult patients. *Hernia*, *13*(4), 343-403. https://doi.org/10.1007/s10029-009-0529-7
11. Baktir, A., Dogru, O., Girgin, M., Aygen, E., Kanat, B. H., Dabak, D. O., & Kuloglu, T. (2012). The effects of different prosthetic materials on the formation of collagen types in incisional hernia. *Hernia*, *17*(2), 249-253. https://doi.org/10.1007/s10029-012-0979-1
12. Zhu, L. (2015). Mesh implants: An overview of crucial mesh parameters. *World Journal of Gastrointestinal Surgery*, *7*(10), 226. https://doi.org/10.4240/wjgs.v7.i10.226
13. Bona, S., Rosati, R., Opocher, E., Fiore, B., & Montorsi, M. (2017). Pain and quality of life after inguinal hernia surgery: A multicenter randomized controlled trial comparing lightweight vs heavyweight mesh (Supermesh study). *Updates in Surgery*, *70*(1), 77-83. https://doi.org/10.1007/s13304-017-0483-3
14. Chui, L. B., Ng, W. T., Sze, Y. S., Yuen, K. S., Wong, Y. T., & Kong, C. K. (2010). Prospective, randomized, controlled trial comparing lightweight versus heavyweight mesh in chronic pain incidence after TEP repair of bilateral inguinal hernia. *Surgical Endoscopy*, *24*(11), 2735-2738. https://doi.org/10.1007/s00464-010-1036-8
15. O'dwyer, P. J., Kingsnorth, A. N., Molloy, R. G., Small, P. K., Lammers, B., & Horeyseck, G. (2005). Randomized clinical trial assessing impact of a lightweight or heavyweight mesh on chronic pain after inguinal hernia repair. *Journal of British Surgery*, *92*(2), 166-170. https://doi.org/10.1002/bjs.4833
16. Pielaciński, K., Szczepanik, A. B., & Wróblewski, T. (2013). Effect of mesh type, surgeon and selected patients' characteristics on the treatment of inguinal hernia with the Lichtenstein technique. Randomized trial. *Videosurgery and Other Miniinvasive Techniques*, 99-106. https://doi.org/10.5114/wiitm.2011.32824
17. Wani, P. M., Shah, R. A., Para, S. A., & Bhat, P. A. (2015). Comparison of outcome between light weight mesh & Heavy weight mesh in Lichtenstein groin hernia repair. *Journal of Medical Science And clinical Research*. https://doi.org/10.18535/jmscr/v3i8.40
18. O'Dwyer, P. J., Kingsnorth, A. N., Molloy, R. G., Small, P. K., Lammers, B., & Horeyseck, G. (2005). Authors' reply: Randomized clinical trial assessing impact of a lightweight or heavyweight mesh on chronic pain after inguinal hernia

repair (*Br J Surg* 2005; 92: 166-170). *British Journal of Surgery*, *92*(5), 655-655. https://doi.org/10.1002/bjs.5065

19. Paajanen, H. (2007). A single-surgeon randomized trial comparing three composite meshes on chronic pain after Lichtenstein hernia repair in local anesthesia. *Hernia*, *11*(4), 335-339. https://doi.org/10.1007/s10029-007-0236-1
20. Aasvang, E. K., Møhl, B., Bay-Nielsen, M., & Kehlet, H. (2006). Pain related sexual dysfunction after inguinal herniorrhaphy. *Pain*, *122*(3), 258-263. https://doi.org/10.1016/j.pain.2006.01.035
21. Burgmans, J. P., Voorbrood, C. E., Simmermacher, R. K., Schouten, N., Smakman, N., Clevers, G., Davids, P. H., Verleisdonk, E. M., Hamaker, M. E., Lange, J. F., & Van Dalen, T. (2016). Long-term results of a randomized double-blinded prospective trial of a lightweight (Ultrapro) versus a heavyweight mesh (Prolene) in Laparoscopic total Extraperitoneal inguinal hernia repair (TULP-trial). *Annals of Surgery*, *263*(5), 862-866. https://doi.org/10.1097/sla.0000000000001579