# A Comparative Study to Evaluate Short-Term Outcome of Inguinal Hernioplasty with Heavy Weight versus Light Weight Polypropylene Mesh in a Tertiary Care Centre of West Bengal

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**ABSTRACT**

**BACKGROUND**

Repair of groin hernia acquired during adult life involves application of a mesh, and avoidance of tension. We wanted to compare the post-operative outcomes mainly chronic groin pain and the feeling of a foreign body (FBR) at the operative site after inguinal Lichtenstein hernioplasty with light- weight (LW) and heavy-weight (HW) mesh, and evaluate the patient's quality of life after inguinal hernia repair.

**METHODS**

This is a randomized prospective study conducted at the department of surgery of a tertiary care centre of West Bengal among 50 male patients in the age group of 15-74 years from September 2016 to August 2019 with a clinical diagnosis of inguinal hernia. The patients were divided in to two equal groups; among them 25 patients underwent Lichtenstein's tension-free mesh hernioplasty with heavy-weight (HW) polypropylene mesh while the rest 25 patients were repaired with light-weight (LW) macro-pore polypropylene mesh. In each group, patients were selected randomly.

**RESULTS**

Compared with heavy-weight (HW) small porous mesh, light-weight (LW) macro pore mesh had the advantage of reduced chronic groin pain at the operation site after inguinal hernioplasty. LW mesh group also had significant advantage of reduced foreign body sensation at the implant recipient site as compared to the HW mesh group.

**CONCLUSIONS**

In spite of advantage of reduced chronic groin pain at the operation site after inguinal hernioplasty, LW mesh did not show any significant advantage in reducing early post-operative complications as compared to HW mesh. Further long term study required with broader sample size.

**KEYWORDS**

Hernioplasty, Heavy Weight Mesh, Light Weight Mesh, Polypropylene

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## BACKGROUND

The history of hernia in toto is as old as the history of surgery. Hernia is the "protrusion of a viscus or part of the viscus through an abnormal opening in the walls of its containing cavity". Inguinal hernia presenting as a bulge in the groin. Italian surgeon Edoardo Bassini made by performing first true herniorrhaphy more than 100 years back. He performed his first operation in 1884 and reported in 1887. He reported 206 operations with eight recurrences. Ziemmerman[1,2,3] quoted as "a record of which any surgeon today could well be proud." This phenomenal results certainly earned him the appellation as the 'Father of Modern herniorrhaphy'. Attempting to suture the mobile muscular side to the fixed, immovable cooper's ligament is against the principle of reconstructive surgery. Pulling muscular tissue to an immovable structure is not only physiologically naïve and structurally destructive but also produces pain and discomfort during movement in the follow up period. The most important principle in reconstruction surgery is to avoid tension when restoring the muscular or elastic structures.

Lichtenstein[4] showed that mesh could be used successfully and the Lichtenstein group Popularized routine use of mesh in 1984 and coined the term "tension-free hernioplasty."[5] The modern biologically based concept for repair of groin hernia, acquired during adult life, is application of a patch, avoidance of tension and use of local, spinal or epidural anesthesia. The aim of our study is to compare the post-operative outcomes mainly chronic groin pain and the feeling of a foreign body (FBR) at the operative site after inguinal Lichtenstein hernioplasty with light- weight (LW) and heavy-weight (HW) mesh, as well as to evaluate the patient's quality of life after inguinal hernia repair.

## METHODS

This is a randomized prospective study conducted at the department of surgery of a tertiary care centre of West Bengal among 50 male patients in the age group of 15-74 years from September 2016 to August 2019 with a clinical diagnosis of inguinal hernia. The patients were divided in to two equal groups; among them 25 patients underwent Lichtenstein's tension-free mesh hernioplasty with heavy-weight (HW) polypropylene mesh while the rest 25 patients were repaired with light-weight (LW) macro-pore polypropylene mesh. In each group, patients were selected randomly.

**Inclusion Criteria**

1. Age >15 yrs. coming for first time repair.
2. Recurrent inguinal hernias.
3. Hernias without features of Obstruction or Strangulation.
4. Informed written consent.

**Exclusion Criteria**

1. Hernias with features of Obstruction or Strangulation.
2. Patients suffering from COPD, Bladder outlet obstruction.

**The Polypropylene Mesh**

It is synthetic polymer. Monofilament fibres of polypropylene are interlocked and knitted to prepare the mesh form. The thickness is 0.69 mm. Also mesh can be cut to any size and shape without concern for its orientation of fibres. The melting point is about 335ºC. So it can easily be autoclaved. The polypropylene is strong monofilament, inert and readily available, it do not harbour infection, its interstices become completely infiltrated with fibroblast and remain strong permanently, it cannot be felt by the patient or surgeon post operatively. Currently, two major mesh concepts are distinguished, the classical concept including so called Heavy-weight (HW) polypropylene meshes with pore size 0.8 mm and a weight of 82 gm/$m^2$ and the new concept including Light-weight (LW) meshes with large pores of 1.0 mm and a weight of 36 gm/$m^2$. The study population is randomly selected for Lichtenstein hernioplasty with HW or LW meshes alternatively.

**Surgical Procedure**

After preoperative anaesthetic fitness patients were admitted. All the operation was done under spinal or epidural anesthesia. After dressing & draping an oblique skin incision of about 7 to 10 cm long was made from pubic tubercle towards iliac spine (1.25 cm above and parallel to the medial two thirds of the inguinal ligament). It was deepened through fascia of Camper and fascia of Scarpa and the subcutaneous tissue to expose both external oblique aponeurosis which was incised medially down to and through the external inguinal ring. The superior flap of external oblique aponeurosis was bluntly dissected off the internal oblique muscle exposing at least 2 cm medial to the pubic tubercle. Iliohypogastric nerve was secured. The cord structures with their cremaster covering, were then separated from the inferior flap of the external oblique aponeurosis by the blunt dissection, exposing the shelving edge of inguinal ligament and were then swept off to the pubic tubercle and separated from the inguinal floor to create a large space for the eventual placement of the mesh.

For indirect hernia, cremaster muscle was incised longitudinally, the sac dissected free from cord structures till the neck, and divided. Proximal end closed with purse-string suture at the neck of the sac and distal part kept open, and bleeding point were secured. In case of direct hernias sac was separated from the cord and other surrounding structures to reduce it back into the pre-peritoneal space. Indirect hernia will present with a sac attached to the cord in an anteromedial position extending superiorly through the internal ring. A direct inguinal hernia will present as a weakness in the floor of the canal posterior to the cord. All the large hernias with posterior wall defects were first repaired with interrupted sutures to ease mesh placement and to further reinforce in addition to mesh. Polypropylene mesh (HW or LW) prosthesis with a size of 15 x 7.5 cm was positioned over the inguinal floor. The prosthesis was not trimmed so that sufficient laxity could be maintained to account for the difference between the supine and upright positions, as well as the event of mesh shrinkage. The lower-

medial end was rounded to correspond to the patient's anatomy and with the interrupted 2-0 polypropylene suture; it was secured to the anterior rectus sheath around 2 cm medial to the pubic tubercle. The mesh was fixed to the pubic tubercle inferiorly. Three to four interrupted polypropylene sutures were applied to fix mesh to inguinal ligament laterally and similar number of sutures fixing to conjoined tendon / internal oblique aponeurosis medially. A slit along the mesh was made at the lateral end creating two tails, keeping two third above and one third of it bellow. The tails were positioned around the cord structures and a single interrupted suture was used to secure the two tails, in effect creating a shutter valve at the internal ring. Haemostasis was secured and the wound was closed in layers. Compression bandage and scrotal support was applied to reduce collection in scrotum.

Post-operative pain was meticulously asked for and was classified according to visual pain score scale and according to post-operative requirement of sedative or analgesic. a. Mild pain- which required paracetamol tablets or Diclofenac rectal suppositories. b. Moderate pain- which required paracetamol tablets + diclofenac sodium. c. Severe pain- which required paracetamol tablets + opioid analgesia or tramadol injection.

Antibiotics were advised for seven post-operative day. The patient is discharged on 3rd post-operative day and was advised to come 8th post-operative day for stitch removal. The patients were followed up at two weeks, one month, three months and six months, data were collected and analysed. During post-operative convalescent period the patients were allowed restricted physical labour and limited weight bearing for period of six weeks.

## RESULTS

This prospective comparative study was carried out on 50 male patients with a clinical diagnosis of inguinal hernia presenting to the surgery OPD of our tertiary care centre. Among them 25 patients underwent Lichtenstein's tension-free mesh hernioplasty with heavy-weight (HW) polypropylene mesh while the rest 25 patients were repaired with light-weight (LW) macro-pore polypropylene mesh, in each group patients were selected randomly.

| Age Group | No. of Cases (HW Mesh) | No of Cases (LW Mesh) | Total Percentage (n- 50) |
|---|---|---|---|
| 15 - 24 | 4(16%) | 3(12%) | 14% |
| 25 - 34 | 3(12%) | 3(12%) | 12% |
| 35 - 44 | 5(20%) | 7(28%) | 24% |
| 45 - 54 | 6(24%) | 4(16%) | 20% |
| 55 - 64 | 5(20%) | 5(20%) | 20% |
| 65 - 74 | 2(8%) | 3(12%) | 10% |
| Total | 25 | 25 | 100% |

***Table 1. Age Distribution***

Table 1 shows majority of our patients were in the age group of 35-44 years (24%). In our study the youngest member was 18 years old and oldest member presented with at the age of 69 years.

| Type | No. of Cases | Percentage |
|---|---|---|
| Indirect | 27 | 54(%) |
| Direct | 23 | 46(%) |
| Recurrent | 0 | 0 |
| Total | 50 | 100% |

***Table 2. Distribution of Different Types of Hernia***

In our present study we got 27 cases (54%) with indirect inguinal hernia, 23 cases (46%) with Direct hernia. (Table 2).

| Side | No. of Cases | Percentage |
|---|---|---|
| Right | 29 | 58% |
| Left | 21 | 42% |
| Bilateral | 0 | 0 |
| Total | 50 | 100% |

***Table 3. Lateralisation of Hernia***

In our study during clinical examination of patients we found right sided hernias in 29 cases (58%), left sided hernias in 21 cases (42%) and without any bilateral cases (vide Table 3).

| Type of Pain | LW Mesh Group/No. (%) | HW Mesh Group/No. (%) |
|---|---|---|
| Mild | 21 (84%) | 16(64%) |
| Moderate | 4 (16%) | 9(36%) |
| Severe | 0 | 0 |
| Total | 25 (100%) | 25 (100%) |

***Table 4. Post-Operative Pain at 1st week***

Post-operative pain at 1st week was recorded and it reveals 21(84%) patients with LW mesh group suffered from mild pain while 16 (64%) patients with HW Mesh group suffered mild pain. (Table 4).

| Type of Pain | LW Mesh Group/ No. (%) | HW Mesh Group/ No. (%) |
|---|---|---|
| No pain | 0 | 0 |
| Mild | 23 (92%) | 19(76%) |
| Moderate | 2 (8%) | 6(24%) |
| Severe | 0 | 0 |
| Total | 25 (100%) | 25(100%) |

***Table 5. Severity of Pain at 1 Month***

At 1 month follow up (vide table 5), 23 patients (92%) in LW group and 19 patients (76%) in HW group suffered mild pain. But more patients with HW group 6 (24%) suffered moderate pain than the LW group patients 2(8%).

| Type of Pain | LW Mesh Group/ No. (%) | HW Mesh Group/ No. (%) |
|---|---|---|
| No pain | 25 (100%) | 22 (88%) |
| Mild | 0 | 3(12%) |
| Moderate | 0 | 0 |
| Total | 25 (100%) | 25 (100%) |

***Table 6. Chronic Groin Pain at 6 months***

Chronic pain at 6 months follow up (vide table 6) showed that no patient in LW group suffered from any pain while 3 patients (12%) in HW group suffered from chronic pain at rest.

| Type of Mesh | With FBR / No. (%) | Without FBR / No. (%) |
|---|---|---|
| Light weight | 5 (20%) | 20(80%) |
| Heavy weight | 9(36%) | 16(64%) |

***Table 7. Foreign Body Reaction (FBR) as a Post-Operative Complication***

Table 7 depicts foreign body reaction (FBR) in post-operative period, 5 patients (20%) in LW group and 9 patients (36%) in HW group showed FBR in post-operative period.

| Type of Complications | LW Mesh Group / No. (%) | HW Mesh Group / No. (%) |
|---|---|---|
| Retention of urine | 1 (4%) | 1 (4%) |
| Seroma | 1 (4%) | 1 (4%) |
| Infection | 2 (8%) | 2 (8%) |
| Induration | 2 (8%) | 3 (12%) |
| Scrotal swelling | 1 (4%) | 1 (4%) |
| Neuralgia | 1 (4%) | 2 (8%) |
| Total | 8 (32%) | 10 (40%) |

***Table 8. Different Complications at Follow Up***

Among main immediate post-operative complications in hernia repair are we got wound infection was 4% (in 1 case each) in both group. Incidence of wound induration is 8% (2 cases) in LW group and 12% (3 cases) in HW group. Wound induration was attributed to the combination of Wound haematoma and oedema; probably has some relation with the extent of dissection required for the repair Incidence of scrotal swelling 4% (1 patient in each Category). It might be related with narrowness of newly constructed rings.

## DISCUSSION

Considering the results obtained in this study, which are depicted in different tables, a detailed discussion could be held from different point of views to arrive at a final evaluation of Lightweight (LW) macro-pore mesh in Lichtenstein hernioplasty in comparison to Heavy-weight (HW) micro-pore mesh. Table 1 shows majority of our patients were in the age group of 35-44 years (24%). Though this result does not tally with Abrahamson et al,[6] where it is found that incidence varies from 5- 8% in patients of aged 35-44 years and about 45% at the age of 75 years. In our study the youngest member was 18 years old and oldest member presented with at the age of 69 years.

Though Western literatures shows male to female ratio of incidence of hernia to be 12:1, but in our present study we have not encountered any single female patient. It can be explained by the fact that our study material was not too large. In our present study in Table no. 2. It revealed 27 cases (54%) with indirect inguinal hernia, 23 cases (46%) with direct hernia. Palumbo and Sharpeet al[7] in 1971 had shown in their study with incidence of indirect hernia was 64.7% and that of direct hernia was 19.2%. In our study during clinical examination of patients we found right sided hernias in 29 cases (58%), left sided hernias in 21 cases (42%) and without any bilateral cases (vide Table 3). Palumbo and Sharpe[7] in 1971 had shown in their study with incidence of right sided hernia was 48.9% and left sided 37.9% and bilateral in 3.2% cases.

In table 4 post-operative pain at 1st week was recorded, and it reveals 21(84%) patients with LW mesh group suffered from mild pain while 16 (64%) patients with HW mesh group suffered mild pain. In contrast of 4 (16%) patients of LW group 9(36%) patients of HW group suffered from moderate pain. At 1 month follow up (vide table 5), 23 patients (92%) in LW group and 19 patients (76%) in HW group suffered mild pain. But more patients with HW group 6 (24%) suffered moderate pain than the LW group patients 2(8%). Nikkolo and colleagues[8] in 2009 showed, 28.1% patients with HW group and 15.3% patients with LW group suffered moderate pain at 1 month follow up. Chronic pain at 6 months follow up (vide table 6) showed that no patient in LW group suffered from any pain while 3 patients (12%) in HW group suffered from chronic pain at rest. Nikkolo and colleagues[8] in 2009 showed chronic pain at 6 months in 6.3% patients of the HW group vs. 0% for the LW group.

Table 7 depicts foreign body reaction (FBR) in post-operative period, 5 patients (20%) in LW group and 9 patients (36%) in HW group showed FBR in post-operative period. Post et al[9] reported that more patients had the feeling of a foreign body after hernia repair with HW mesh compared with LW mesh (43.8 vs. 17.2%). Among main immediate post-operative complications in hernia repair are we got wound infection was 4% (in 1 case each) in both group. Incidence of wound induration is 8% (2 cases) in LW group and 12% (3 cases) in HW group. Wound induration was attributed to the combination of Wound haematoma and oedema; probably has some relation with the extent of dissection required for the repair Incidence of scrotal swelling 4% (1 patient in each category). It might be related with narrowness of newly constructed rings.

In this study, we have carried out Lichtenstein's tension free inguinal hernioplasty with light- weight (LW) macro-pore mesh and with heavy-weight (HW) small porous mesh after randomly selecting the patients for mesh type. The short-term outcome mainly in respect to foreign body reaction (FBR) and chronic groin pain were studied in the post-operative period. There were only 10 patients(40%) in HW group and 8 patients(32%) in LW group suffering from early post-operative complications like retention of urine, seroma, infection, induration, scrotal swelling.

## CONCLUSIONS

Compared with heavy-weight (HW) small porous mesh, light-weight (LW) macro pore mesh has the advantage of reduced chronic groin pain at the operation site after inguinal hernioplasty. LW mesh group also had significant advantage of reduced foreign body sensation at the implant recipient site as compared to the HW mesh group. But, LW mesh did not show any significant advantage in reducing early post-operative complications as compared to HW mesh. During follow up there was no major complication/ recurrence.

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