Original Research Article

A comparative study between light and heavy polypropylene mesh in lichtenstein repair of inguinal hernia

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ABSTRACT

Background: Inguinal hernia repair is one of the most common surgical procedures performed in practice. Although numerous techniques have been described, currently tension free mesh repair is the standard of care in the treatment of hernias because of the low recurrence rates.

Methods: A comparative study between Light and Heavy Polypropylene mesh in Lichtenstein repair of inguinal hernia was conducted at Department of General Surgery in MVJ Medical college and Research Hospital, Hoskote, Bangalore on patients admitted in Department of General Surgery between November 2014 to July 2016 undergoing Lichtenstein tension free mesh repair for inguinal hernia. The study is a prospective study. 30 Patients were in Light mesh group and 30 were in Heavy mesh group.

Results: Age group of 31-40 yrs had highest incidence of inguinal hernia. Males outnumber Females in incidence of Inguinal Hernia. Foreign body sensation in Heavy mesh group is significantly high. Average of 26.7% of the patients had foreign body sensation in Heavy mesh group. Whereas in Light group average was 10%. Chronic pain also showed significant readings in Heavy mesh group. Stiffness over abdominal wall was complained by 10% of patients overall in the light mesh group whereas no patients had this complaint in light mesh group. Recurrence was high in light mesh group where total of 5 patients had recurrence and in heavy there were only 2 patients with recurrence.

Conclusions: In my study light mesh has been proved to be better than heavy mesh in treatment of inguinal hernia.

Keywords: Comparative, Hernia, Heavy, Light, Lichtenstein, Polypropylene

INTRODUCTION

Hernia is derived from the Latin word for rupture. A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Although a hernia can occur at various sites of the body, these defects most commonly involve the abdominal wall, part in inguinal region. Inguinal hernia most probably has been a disease ever since mankind existed. Written proof of this statement became available from manuscripts and found in Mesopotamian and Egyptian cultures. So, does the famous papyrus of Ebers, dating from around 1550 BC, refer to patients suffering from Inguinal hernia, quoting its appearance during coughing.

It was the Italian surgeon Eduardo Bassini (1844-1924), who around 1884 invented such new concept with his muscular reinforcement technique of the posterior wall. His first publication dates from 1887. His technique consisted of suturing the falk aponeurotica (or conjoined tendon) to the inguinal ligament of Poupart. The results were astonishing. So was the infection rate reduced to 4%. The turning point in hernia surgery was discovery of synthetic polymers by Carothers in 1935. Usher in 1959
introduced use of mesh in hernia repair. The first tensionless technique described by Lichtenstein was based on strengthening of the posterior wall of inguinal canal with prosthetic material. The initial part of the operation is identical to Bassini. Once the hernia sac has been removed and any medial defect closed, a piece of mesh, measuring 8x15cm, is placed over the posterior wall, behind the spermatic cord, and is split to wrap around the spermatic cord at the deep inguinal ring. Loose sutures hold the mesh to the inguinal ligament and conjoint tendon.

Lichtenstein published the data on 1,000 operations with Marlex mesh without any recurrence in 5 years after surgery. Thus, new rule of groin hernia repair was introduced—tensionless repair. The next step was introduction of a Prolene Mesh which had properties showing minimal tissue reactivity and high durability. Since 1995 various studies on abdominal wall mobility and textile design on mesh was undertaken and many modifications made and tried. The original logic behind using a mesh was very simple: the mesh was a material which could be used to reinforce the abdominal wall with the formation of scar tissue. It was expected that the best meshes would be those made of very strong material and able to induce the most fibrosis.

Unfortunately, this fibrotic reaction led to pain and movement restriction and it soon became clear that this needed to be minimized. In order to do this, the surface area, and therefore strength, of the mesh had to be reduced. Calculations of intra-abdominal pressures proved that this would be possible without compromising mesh function. In fact, the tensile strength of a mesh required to withstand the maximum abdominal pressure is only a tenth of that of most meshes. This realization led to the concept of light-weight meshes. It has been surmised that the inflammatory reaction to the foreign material is correlated with the amount and structure (i.e., pore size) of the synthetic material inserted. Tension-free repair with non-absorbable mesh (polypropylene) has been used in a higher number of cases during the past few years. When meshes are categorized by density, a mesh with density >100g/m² is accepted as heavy, whereas a 35-50g/m² density is classified as lightweight. Several recent controlled clinical studies have suggested that lightweight meshes may improve patient comfort.

Both the light, partially absorbable mesh and the heavy, non-absorbable mesh used in the Lichtenstein technique are equally effective for prevention of inguinal hernia recurrence. Light, partially absorbable mesh vs. heavy, non-absorbable mesh results in lower intensity of chronic pain, lower risk and intensity of postoperative ailments, faster return to normal activities of daily living and sport as well as higher satisfaction with treatment. The type of mesh has no effect on surgery duration, risk of intraoperative and early postoperative complications, or pain intensity in the early postoperative period.

The aim of the study is to compare and analyse the differences between heavy and light polypropylene meshes. Light and the heavy, non-absorbable mesh used in the Lichtenstein technique are equally effective for prevention of inguinal hernia recurrence. To compare and analyse the difference between heavy and light polypropylene mesh for the following outcomes.

- Foreign body sensation
- Chronic pain
- Recurrence
- Patient post-operative recovery time and return to normal activities.

**METHODS**

A comparative study between Light and Heavy Polypropylene mesh in Lichtenstein repair of inguinal hernia was conducted at Department of General Surgery in MVJ Medical college and Research Hospital, Hoskote, Bangalore on patients admitted in Department of General Surgery between November 2014 to July 2016 undergoing Lichtenstein tension free mesh repair for inguinal hernia.

**Inclusion criteria**

- Unilateral or bilateral inguinal hernia of either sex
- Age more than 18yrs
- Hernia of all sizes.

**Exclusion criteria**

- Patients without consent
- Complicated inguinal hernias
- Recurrent hernias
- Femoral hernia
- Cases with previous history of explanation of mesh
- Patients with active infection in the inguinal region.

Comparative study done on 60 patients admitted in Department of General Surgery between November 2014 to July 2016 undergoing Lichtenstein repair for inguinal hernia. 30 Patients were in Light mesh group and 30 were in Heavy mesh group.

A detail study of these patients was done as per Proforma regarding following points to prove which mesh is better.

- Patients will be followed up post operatively at the end of 2 weeks, 1 Month, 3 Months 6 Months and 1 year for recurrence, foreign body sensation, pain and return to normal activities
- Patients complaining of persistent pain at the operative site during the 3rd month follow up will be considered as having chronic pain
- Patients will be taken for ultrasonography on 2nd, 3rd, 4th and 5th follow up visits for determining local
tissue reaction/subclinical recurrence and mesh shrinkage.

On the basis of above outcome and results data will be statistically analysed to reach a definitive conclusion.

RESULTS

Table 1: Age distribution of patients studied.

| Age in years | Heavy mesh | Light mesh |
|--------------|------------|------------|
| No | % | No | % |
| 21-30 | 5 | 16.7 | 3 | 10.0 |
| 31-40 | 10 | 33.3 | 15 | 50.0 |
| 41-50 | 10 | 33.3 | 4 | 13.3 |
| 51-60 | 2 | 6.7 | 3 | 10.0 |
| 61-70 | 2 | 6.7 | 5 | 16.7 |
| >70 | 1 | 3.3 | 0 | 0.0 |
| Total | 30 | 100.0 | 30 | 100.0 |

Samples are age matched with P=0.466 In this Study maximum patients were of age group 31-40 and 41-50(each 10) in Heavy mesh group. In the Light mesh group maximum patients were in 31-40 age group (15). Youngest patient being 24 years old and eldest being 71 years old in the whole sample size. Mean age of patients in Heavy group is 41.70 and in Light group is 44.10.

Table 2: Gender distribution of patients studied.

| Gender | Heavy mesh | Light mesh |
|--------|------------|------------|
| No | % | No | % |
| Female | 4 | 13.3 | 1 | 3.3 |
| Male | 26 | 86.7 | 29 | 96.7 |

Foreign body sensation

Foreign body sensation in Heavy mesh group is significantly high. 9 patients in Heavy mesh group had Foreign body sensation in 2nd week follow up. Where as in Light group it is 3 patients. In one month follow up Heavy Mesh Group had 9 patients whereas as in Light group it was 4. In three months follow up Heavy mesh group had 8 patients whereas Light had 4 patients. In 6 months follow up Heavy Mesh Group had 3 patients whereas Light mesh group had 2 patients. In one year follow up Heavy mesh group had 1 patient and light mesh group had none.

Table 3: Type of hernia in two groups of patients studied.

| Type of hernia | Heavy mesh | Light mesh |
|----------------|------------|------------|
| No | % | No | % |
| Right indirect | 12 | 40.0 | 14 | 46.7 |
| Left indirect | 11 | 36.7 | 6 | 20.0 |
| Right direct | 7 | 23.3 | 9 | 30.0 |
| Bilateral direct | 0 | 0.0 | 1 | 3.3 |
| Total | 30 | 100.0 | 30 | 100.0 |

Pain

Chronic pain is considered in this study as pain which persists on or after 3rd month follow up. On 3rd month follow up Heavy mesh group had 7 patients with chronic pain whereas in light mesh group there were 3 patients. On 6th month follow up Heavy mesh group had 4 patients whereas light mesh group had 2 patients. On one year follow up Heavy Mesh group had 2 patients whereas light mesh group had 1 patient.

Table 4: Foreign body sensation- an evaluation from 2nd week to 1 year in two groups of patients studied.

| Foreign body sensation | 2 weeks follow up | 1 month follow up | 3 months follow up | 6 months follow up | 1 year follow up | % change |
|------------------------|------------------|------------------|-------------------|-------------------|-----------------|----------|
| Heavy mesh (n=30)      |                  |                  |                   |                   |                 |          |
| No                     | 21 (70%)         | 21 (70%)         | 22 (73.3%)        | 27 (90%)          | 29 (96.7%)      | 26.7%    |
| Yes                    | 9 (30%)          | 9 (30%)          | 8 (26.7%)         | 3 (10%)           | 1 (3.3%)        | -26.7%   |
| Light mesh (n=30)      |                  |                  |                   |                   |                 |          |
| No                     | 27 (90%)         | 26 (86.7%)       | 26 (86.7%)        | 28 (93.3%)        | 30 (100%)       | 10.0%    |
| Yes                    | 3 (10%)          | 4 (13.3%)        | 4 (13.3%)         | 2 (6.7%)          | 0 (0%)          | -10.0%   |
| P value                | 0.053+           | 0.117            | 0.197             | 1.000             | 1.000           | -        |

Chi-square test/fisher exact test.
Stiffness over abdominal wall

In the heavy mesh group 3 patients had stiffness over abdominal wall in the 2nd week follow up, 3 in 1 month follow up, 3 in 3 months follow up, 2 in 6 months follow up and nil in 1 year follow up. In light mesh group there was no patients with stiffness over abdominal wall throughout.

Table 5: Pain- an evaluation from 2nd week to 1 year in two groups of patients studied.

| Pain | 2 weeks follow up | 1 month follow up | 3 months follow up | 6 months follow up | 1 year follow up | % change |
|------|------------------|------------------|-------------------|-------------------|-----------------|----------|
| Heavy mesh (n=30) | | | | | | |
| No | 22 (73.3%) | 22 (73.3%) | 23 (76.7%) | 25 (83.3%) | 28 (93.3%) | 20.0% |
| Mild | 2 (6.7%) | 2 (6.7%) | 4 (13.3%) | 4 (13.3%) | 2 (6.7%) | 0.0% |
| Moderate | 5 (16.7%) | 5 (16.7%) | 3 (10%) | 1 (3.3%) | 0 (0%) | -16.7% |
| Severe | 1 (3.3%) | 1 (3.3%) | 0 (0%) | 0 (0%) | 0 (0%) | -3.3% |
| Light mesh (n=30) | | | | | | |
| No | 28 (93.3%) | 27 (90%) | 27 (90%) | 28 (93.3%) | 29 (96.7%) | 3.4% |
| Mild | 0 (0%) | 1 (3.3%) | 2 (6.7%) | 2 (6.7%) | 1 (3.3%) | 3.3% |
| Moderate | 1 (3.3%) | 1 (3.3%) | 1 (3.3%) | 0 (0%) | 0 (0%) | -3.3% |
| Severe | 1 (3.3%) | 1 (3.3%) | 0 (0%) | 0 (0%) | 0 (0%) | -3.3% |
| P value | 0.101 | 0.278 | 0.394 | 0.424 | 0.599 | - |

Chi-square test/fisher exact test.

Table 6: Stiffness over abdominal wall- an evaluation from 2nd week to 1 year in two groups of patients studied.

| Stiffness over abdominal wall | 2 weeks follow up | 1 month follow up | 3 months follow up | 6 months follow up | 1 year follow up | % change |
|-------------------------------|------------------|------------------|-------------------|-------------------|-----------------|----------|
| Heavy mesh (n=30) | | | | | | |
| No | 27 (90%) | 27 (90%) | 27 (90%) | 28 (93.3%) | 30 (100%) | 10.0% |
| Yes | 3 (10%) | 3 (10%) | 3 (10%) | 2 (6.7%) | 0 (0%) | -10.0% |
| Light mesh (n=30) | | | | | | |
| No | 30 (100%) | 30 (100%) | 30 (100%) | 30 (100%) | 30 (100%) | 0.0% |
| Yes | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0.0% |
| P value | 0.237 | 0.237 | 0.237 | 0.492 | 1.000 | - |

Chi-square test/fisher exact test.

Table 7: Recurrence- an evaluation from 2nd week to 1 year in two groups of patients studied.

| Recurrence | 2 weeks follow up | 1 month follow up | 3 months follow up | 6 months follow up | 1 year follow up | % change |
|------------|------------------|------------------|-------------------|-------------------|-----------------|----------|
| Heavy mesh (n=30) | | | | | | |
| No | 30 (100%) | 30 (100%) | 29 (96.7%) | 29 (96.7%) | 30 (100%) | 0.0% |
| Yes | 0 (0%) | 0 (0%) | 1 (3.3%) | 1 (3.3%) | 0 (0%) | 0.0% |
| Light mesh (n=30) | | | | | | |
| No | 30 (100%) | 30 (100%) | 29 (96.7%) | 27 (90%) | 29 (96.7%) | -3.3% |
| Yes | 0 (0%) | 0 (0%) | 1 (3.3%) | 3 (10%) | 1 (3.3%) | 3.3% |
| P value | 1.000 | 1.000 | 1.000 | 0.612 | 1.000 | - |

Chi-square test/fisher exact test.

Recurrence

Two patients showed recurrence in Heavy mesh group one in 3 months follow up and one in 6 months follow up. Four patients showed recurrence in light mesh group. One in 3 months follow up, 3 in 6 months follow up and one in 1 year follow up.

DISCUSSION

In this comparative study between light and heavy polypropylene mesh in lichtenstein repair of inguinal hernia which was conducted in MVJ Medical College and Research Hospital. Total of 60 patients were studied. 30
Patients each were allotted in Heavy mesh group and Light mesh group respectively.

Konrad Pielacinski, Andrzej B, Szczepanik et al in their study done in Warsaw, Poland discussed that although tension-free surgical techniques for inguinal hernia repair have contributed to the improvement of the outcome as well as the marked reduction of hernia recurrence, these techniques are not free of complications. The most common and still unresolved clinical problem is the chronic pain in the operated groin. One of the likely reasons which are taken into account is the presence of the mesh and its type. Research data show that the amount and structure of the implanted material have a significant influence on scar tissue formation. Heavy propylene non-absorbable meshes cause a more intense inflammatory reaction and scar formation than the light propylene or partially absorbable meshes. The implied superiority of light meshes was confirmed in clinical trials but with relatively short follow-up periods.6

The study also concluded that both the light and the heavy, non-absorbable mesh used in the Lichtenstein technique are equally effective for prevention of inguinal hernia recurrence. Light vs heavy, non-absorbable mesh results in lower intensity of chronic pain, lower risk and intensity of postoperative ailments, faster return to normal activities of daily living and sport as well as higher satisfaction with treatment. The type of mesh has no effect on surgery duration, risk of intraoperative and early postoperative complications, or pain intensity in the early postoperative period. Individual patients’ characteristics such as body mass, general condition, type of hernia, surgery duration and operator have a significant effect on the risk of intraoperative damage, percentage of early complications, return to normal activities of daily living, chronic pain, ailments in the operated groin and patient’s satisfaction with treatment.6

In a study conducted by Keith Rose, David Wright et al done at University Department of Surgery, South Manchester University Hospital, West Didsbury, Manchester, UK where the outcome of 200 consecutive patients with inguinal hernias repaired by the tension free mesh technique at a specialist clinic was assessed one year after operation.7 Of the total, 118 (66%) patients were discharged on the day of operation and 60 (34%) the following morning. There were no unplanned overnight stays and no readmissions. Fifty-four (30%) patients had no pain the day after operation. A further 53 (30%) had pain for up to 5 days, 38 (21%) for up to 10 days and 33 (19%) for over 10 days. Twenty-seven (15%) patients had returned to normal activity within 7 days, 73 (41%) within 2 weeks and 145 (66%) within a month of operation.7

Lichtenstein published a personal series of 6321 repairs of which 21.3% were for recurrence, and found a recurrence rate of 0.7% after a minimum follow up of 2 years.8

In a study done by A.E.Kark and M.Kurzer of British Hernia Centre, London the technical problems, early complications and short-term results of a tension-free method inguinal hernia repairs(Lichtenstein’s repair) in 1017 patients have been assessed.9 In this study of the total patients, 21.3% required no pain killers after the first night; 59.2% took oral analgesia for 1-7 days (13.2% up to 3 days and 46% for 4-7 days). Thus, after 1 week 80% of patients required no further analgesia. Neuritic-type pain in the groin at any point from the anterior superior spine to the upper scrotum and thigh persisted in 10 patients. Pain of this type persisted beyond a 6-month period in eight patients and gradually disappeared over the next 12 months.9

Just E and Botet X et al in their study titled Reduction of complication rate in Lichtenstein hernia repair done in Department of General Surgery, Hospital Alt Penedes, Barcelona, Spain found that out of overall cases operated, 155 (7.7%) wounds developed complications, 74 of which (3.7%) were haematomas, 44 (2.2%) infections, 27 (1.3%) seromas, and 10 (0.5%) were complications from other causes.10 Lloyd D Mclean in his editorial “Repair of Inguinal Hernia” said that Excellent results with very low recurrence rates (less than 5%, frequently less than 1%) have been reported for primary repair of inguinal hernias by these techniques by surgeons with large experience and dedicated interest.11

CONCLUSION

The comparative study between Light and Heavy polypropylene mesh in Lichtenstein repair of inguinal hernia concluded as. Light Mesh has been proved to be better than Heavy Mesh in the Following points.

- Light Mesh has less incidence of stiffness over abdominal wall post operatively in comparison to Heavy mesh
- Light Mesh has less incidence of foreign body sensation post operatively than Heavy mesh
- Light mesh has less incidence and lesser severity of chronic pain than Heavy mesh
- Heavy mesh has lower recurrence rates than Light mesh.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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