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A COMPARATIVE STUDY OF THE OUTCOME OF ULTRALIGHT WEIGHT AND HEAVY WEIGHT POLYPROPYLENE MESH IN LICHTENSTEIN REPAIR OF INGUINAL HERNIA

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ABSTRACT

AIMS & OBJECTIVE: To compare and analyse the differences between using a heavy or an ultralight weight polypropylene mesh for Lichtenstein repair of inguinal hernia, in terms of foreign body sensation, chronic pain & recurrence of hernia.

MATERIAL AND METHOD: Fifty patients were randomly divided into two groups of twenty-five each, using heavy polypropylene mesh in one group and ultralight mesh in the other. Patients were followed up in the immediate post op **(operative)** period, 1 week, 3 months and 6 months since surgery for pain, foreign body sensation and recurrence. This was done through OPD visits, personal visits and in a few cases by video-calling or telephonic conversations (following the covid-19 protocols, especially between April '20 and September '20). On the basis of observations, outcome and results, data was statistically analysed to reach a definitive conclusion.

RESULTS: Of the 25 patients randomised for the heavy mesh group, the incidence of foreign body sensation and pain in the immediate post-operative period, 1week, 3months and 6 months though higher than in the other group of 25 patients with ultralight mesh, were not statistically significant. There were no recurrences in either group, clinically or radiologically at 6 months.

CONCLUSION: The study conducted above concludes that most of the inguinal hernias in men were right sided, of indirect type in younger age group and direct type in the older age group. There is no statistically significant difference in using either type of mesh for a Lichtenstein repair in terms of pain, discomfort or foreign body sensation. There were no recurrences in either group.

KEYWORDS

Inguinal hernia, Heavy Weight Mesh, Ultralight Weight Mesh, Lichenstein repair.

INTRODUCTION:

Inguinal hernia is a condition known since ancient times. Written proof of its existence are available from manuscripts discovered from Mesopotamian and Egyptian cultures. Inguinal hernia, named after its anatomical location, is a protrusion of viscus or part of a viscus through the wall of its containing cavity. It is one of the most common afflictions affecting adults, with a lifetime risk of developing inguinal hernia of 27% in men and 3% in women.

The commonest and the Gold Standard for repair of inguinal hernias has been the tensionless mesh repair described by Lichtenstein, based on strengthening of the posterior wall of inguinal canal with a prosthetic material.[1] All prosthetic materials or meshes provoke a fibrous reaction resulting from fibroblast proliferation. It is believed that the dense and heavyweight mesh would provoke a greater tissue reaction, leading to increased collagenization and hence more contraction & stiffening, making the repair stronger and prone to a lesser chance of recurrence.[2] Whether this translated to lower recurrence rates [3]or increased patient discomfort[4] has often been debated. When meshes are categorized by density, a mesh with density >100g/m^2 is accepted as heavy, whereas a mesh with a density less than 35g/m^2 is classified as ultralightweight mesh. Light weight meshes are between 35 and 100g/m^2. The recurrence rates in patients where light weight meshes are used is comparable to heavier meshes in terms of recurrence. Several recent controlled clinical studies have suggested that lightweight meshes may improve patient comfort as well.[4,5] The aim of this study was to compare and analyse the differences if any, between using a heavy and an ultralight weight polypropylene mesh in terms of recurrence on one hand and the feeling of foreign body sensation and chronic pain on the other.

METHODS:

The primary objective of the study was to see for differences in using a robust mesh versus a very lightweight mesh. The two groups were the heavy weight mesh (HMW) and the ultralight weight mesh (UMW) group. This prospective, randomised, controlled trial was conducted at the department of general surgery of the MLN Medical College, Prayagraj over a period of one and a half years, after approval from the institutional ethics committee. All male patients with unilateral or bilateral inguinal hernias aged between 30 to 60 years were taken up for study. The patients excluded from the study were female patients, complicated inguinal hernias (obstructed or strangulated), recurrent hernias, femoral hernias, patients with active infection in the inguinal region, patients with any chronic illnesses like diabetes mellitus, COPD etc., patients with serious morbid illnesses or patients not consenting to be part of the study. Sample size of 25 was calculated using the PASS software, considering the power of study as 80% and level of significance at 5%. There were no drop outs. Patients were randomly divided into two groups based on the type of mesh to be used (The Ultralight Weight mesh group & the Heavy Weight mesh) through randomisation by lucky draw method through chits in the box technique. The operating surgeon was handed over the chit just before surgery. The patient and the nursing staff involved in the post-operative care were blinded till the day of discharge. All patients underwent a standard Lichtenstein repair for uncomplicated inguinal hernia, performed by a single senior consultant surgeon after routine preoperative investigations. All surgeries were performed under spinal anaesthesia in a controlled and similar environment by the same surgeon. All patients received a single dose of preoperative antibiotic, Inj. Amoxycillin/Clavulanic acid, 1.2gms just before spinal anaesthesia. They received similar post op analgesia, using Inj. Diclofenac in the immediate postop period and a second dose after 8 hours of the first. They were shifted to oral analgesics from the following day. Patients were then followed up in the immediate post op period (Day 1) after the effects of regional anaesthesia had worn off, also at 1 week, on the day of stitch removal, and then 3 months and 6 months later, for symptoms of pain, discomfort, foreign body sensation and recurrence. A standard questionnaire was made which also included pictorial VAS score sheets. This follow up was done through OPD visits, personal visits, video-calling or telephonic conversations, following covid-19 protocols. All patients underwent an inguinoscrotal ultrasonography at 6 months to rule out a sub clinical recurrence.

STATISTICAL ANALYSIS:

Data were recorded as Mean and SD. P-value of ≤ 0.05 was considered as significant. Fishers-exact test and chi-square test were used for statistical evaluation.

RESULTS:

Table 1: Age distribution of patients studied

Age in Years	Heavy mesh		Ultralight mesh	
	Number	%	Number	%
31-40	10	40	14	56
41-50	02	08	04	16
51-60	13	52	07	28
Total	25	100%	25	100%

Most patients were in age group 31-40yrs in both the groups. Youngest patient being 31 years old and eldest being 60 years old. Mean age of patients in Heavy mesh group is 45.48 and in Ultralight mesh group is 41.8.

Table 2: Type of hernia in two groups of patients studied

Type of hernia	Heavy mesh		Ultralight mesh	
	No.	%	No.	%
Right Indirect	09	36%	09	36%
Left Indirect	02	8%	07	28%
Right Direct	08	32%	05	20%
Left Direct	02	8%	03	12%
Bilateral Defect	04	16%	01	4%
Total	25	100%	25	100%

Right Indirect hernia was predominant in both groups (36% each). In Heavy weight mesh group, there were 4 (16%) cases of bilateral defect whereas only one (4%) case in the Ultralight mesh group.

Table 3: Foreign body sensation- an evaluation from 1st week to 6 months in the two groups of patients studied

Foreign Body Sensation	1st week	3 months	6 months
Heavy Mesh(N=25)			
Yes	07 (28%)	06 (24%)	03 (12%)
No	18 (72%)	19 (76%)	22 (88%)
Ultralight Mesh(N=25)			
Yes	03 (12%)	02 (08%)	01 (04%)
No	22 (88%)	23 (92%)	24 (96%)
P value (Chi-square test/fisher exact test.)	0.157	0.122	0.297

The incidence of foreign body sensation in the heavy mesh group is high 7 (28%), whereas in Ultralight mesh group it is 3 (12%) patients. Though there is an observed difference, but this difference is not statistically significant (p=0.157). At three months follow up, the Heavy Mesh Group had 6 (24%) patients who complained of a foreign body sensation as compared to 2 (8%) patients in the ultralight group(p=0.122) At six months follow up, though 3 (12%) patients in the Heavy mesh group complained of the problem, the Ultralight group had only 1 (4%) patient(p=0.297). The difference at both 3 months and 6 months were not statistically significant. It is worth noticing that though the feeling of foreign body sensation was a few percentage points lesser in the ultralight weight mesh group, the difference was not statistically significant.

Table 4: Pain- an evaluation from post op day 1 to 6 months in two groups of patients studied.

Pain	Post op day 1	1 week Follow up	3 Month Follow-up	6 Month Follow-up
Heavy Mesh (N=25) (HWM)				
No	18 (72%)	18 (72%)	19 (76%)	19 (76%)
Mild	02 (8%)	02 (8%)	04 (16%)	05 (20%)
Moderate	04 (16%)	04 (16%)	02 (8%)	01 (4%)
Severe	01 (4%)	01 (4%)	0	0
Ultralight Mesh (UWM) (N=25)				
No	20 (80%)	19 (76%)	20 (80%)	21 (84%)
Mild	03 (12%)	04 (16%)	04 (16%)	04 (16%)
Moderate	01 (4%)	02 (8%)	01 (4%)	0
Severe	01 (4%)	0	0	0
P value (Chi-square test/fisher exact test)	0.507	0.747	0.732	0.4795

On post-operative day 1, heavy mesh group had 2 (8%) patients with mild pain,4 (16%) patients with moderate pain and 1 (4%) patient with severe pain whereas in ultralight mesh group there were 3 (12%) patients with mild pain,1 (4%) patient with moderate pain and 1 (4%) patient with severe pain. On 1st week follow up heavy mesh group had 2 (8%) patients with mild pain,4 (16%) patients with moderate pain and 1 (4%) patient with severe pain whereas in ultralight mesh group there were 4 (16%) patients with mild pain,2 (8%) patients with moderate pain and no patient with severe pain. On 3rd month follow up heavy mesh group had 4 (16%) patients with mild pain, 2 (8%) patients with moderate pain and no patient with severe pain whereas in ultralight mesh group there were 4 (16%) patients with mild pain,1 (4%) patient with moderate pain and no patient with severe pain. On 6 month follow up heavy mesh group had 5 (20%) patients with mild pain, 1(4%) patient with moderate pain and no patient with severe pain whereas in ultralight mesh group there were 4 (16%) patients with mild pain, no patient with moderate pain and no patient with severe pain over operated site.

As compared with HWM (heavy weight mess) group, the UWM (ultra light weight mess)group has lesser incidence of post-operative pain with P values 0.507, 0.747, 0.732 and 0.479 for the follow up period of post-operative day1, 1st week, 3 months and 6 months, respectively. However, this difference is not statistically significant.

Table 5: Recurrence-evaluation from 3rd month to 6 months of follow-up

Recurrence	3rd month	6th month
Heavy Mesh (N=25)		
No	25 (100%)	25 (100%)
Yes	0 (0%)	0 (0%)
Ultralight Mesh (N=25)		
No	25 (100%)	25 (100%)
Yes	0 (0%)	0 (0%)

No patient showed recurrence in neither heavy mesh group nor in ultralight mesh group at 3 months or 6 months of follow up.

DISCUSSION:

Lichtenstein repair of inguinal hernia is the gold standard for open repairs. The mesh used in this common surgery can range from heavy weight mesh with a density of >100g/m^2 to ultralight weight mesh with a density of ≤35gm/m^2. Although tension-free mesh repairs for inguinal hernia repair have contributed to the improvement in outcome as well as the marked reduction of hernia recurrence, these techniques are not free from complications.

The most common and still unresolved clinical problem is of chronic pain in the operated groin [5,6,7]. One of the likely reasons which accounts for this 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 ultralight propylene or partially absorbable meshes [2,7]. Logically this should amount to lesser pain, discomfort and the lesser foreign body sensation in ultralight mesh.

In the study conducted by Stefano Bona et al[8] in 2018, a statistically significant difference in favour of lightweight mesh was found at multivariable analysis for pain (1 week and 6 months after surgery: p = 0.02 and p = 0.04, respectively). Similar results were obtained from studies conducted by J Li et al[18], Chunlin Zhong et al[19] and Simon Nienhuijs et al[29]. In all these studies, it was concluded that light weight mesh repair of inguinal hernia has better outcomes in terms of chronic pain as compared with heavy weight mesh repair. In the study conducted by Wouter J Bakker et al[5] in 2019, a significant reduction was seen for the feeling of a foreign body sensation. The study concludes that Lightweight mesh should be used in open (Lichtenstein) inguinal hernia repair. Similarly, in the study conducted by Syed Nasiruddin et al[11] in 2017, foreign body sensation in heavy mesh group was significantly high.

On the contrary however, the presence of pain was significantly higher in the lightweight mesh group (2.9%) compared with the heavyweight mesh group (0.7%) (P = 0.01) in a study conducted by Josephina P J Burgmans et al[13] in 2016. After 2 years this difference remained significant (P = 0.03). In a study conducted by Andrew Currie et al[17] in 2012, eight trials were included in the analysis of 1,667 hernias in 1,592 patients. Lightweight and heavyweight mesh repair had similar outcomes with regard to postoperative pain.

So there are contrary reports in literature regarding the use of polypropylene meshes in open inguinal hernia repair studies.

From our study, it is evident that HWM (heavy weight mess) group had higher incidence of chronic pain and discomfort as compared to that of UWM (ultra light weight mess) group in all the follow up intervals of 1st post-operative day, 1st week, 3 months and 6 months postoperatively, but the difference was not statistically significant with P values of 0.507, 0.747, 0.732 and 0.479 respectively.

The other issue of foreign body sensation in post hernioplasty patients has been reported to be similar in both groups of heavy and light weight meshes by many authors.[7,13,17]. They reported that Lightweight and heavyweight mesh repair had similar outcomes with regard to postoperative foreign body sensation.

From our study, it is evident that HWM (heavy weight mess) group has a higher incidence of post-operative foreign body sensation as

compared to that of UWM (ultra light weight mess) group in all the follow up interval periods. As compared with HWM (heavy weight mess) group, the UWM (ultra light weight mess) group has lesser incidence of foreign body sensation with P values 0.157, 0.122 and 0.297 for the follow up period of 1st week, 3 months and 6 months, respectively. However, this difference is again not statistically significant.

In a study conducted by Josephina P J Burgmans et al[13] in 2016, there were 4 (0.8%) recurrent hernias in the heavyweight mesh group and 13 (2.7%) in the lightweight group (P = 0.03). Similar results were obtained with the studies conducted by J Li et al[12], Chunlin Zhong et al[13] and L B Chui et al[14]. In all these studies, although there were higher incidence of recurrence in lightweight mesh repair of inguinal hernia as compared with heavyweight mesh repair, this difference was statistically not significant.

Our study also concluded that both the Ultralight and the heavy mesh used in the Lichtenstein technique are almost equally effective for prevention of inguinal hernia recurrence as there were no incidence of recurrence both clinically and on radiologically, in either group.

CONCLUSION:

In this comparative study between Heavy Weight Mesh (HWM) and Ultralight Weight Mesh (UWM) polypropylene mesh in Lichtenstein repair of inguinal hernia which was conducted in a period of one and a half years, a total of 50 patients were studied with 25 patients allotted to heavy and ultralight mesh groups equally.

The conclusions drawn from the above study are as follows:

- Most of the inguinal hernia cases were right sided hernia, which were mostly indirect type in younger age group and direct type in older age group.
- Foreign body sensation in both the HWM & UWM groups were similar and not statistically significant at the end of 1st week, 3 months and 6 months (p values 0.157, 0.122 and 0.297). However, a higher percentage of patients in the HWM group had foreign body sensation, i.e, 28% in HWM vs 12 % in UWM at 1st week, 24% vs 8% at 3 months and 12% vs 4 % at end of 6 months of follow up.
- Post-operative pain sensation in both the HWM & UWM groups were similar and not statistically significant at the end of post-operative day 1, 1st week, 3 months and 6 months (p values 0.507, 0.747, 0.732 and 0.479). However, a higher percentage of patients in the HWM group had post-operative pain sensation, i.e, 28% in HWM vs 20 % in UWM at post op day 1, 28% vs 24% at 1st week, 24% vs 20% at 3 months and 24% vs 16 % at end of 6 months of follow up.
- No patient showed recurrence in either heavy mesh group (HWM) nor in ultralight mesh group (UWM) at 3 months or 6 months of follow up.

LIMITATION OF STUDY:

The sample size was limited due to the lockdown and closure of elective operation theatres between April '20 and September '20. Only 50 patients could be included for the given time period of study. A larger cohort or a meta-analysis combining data of many such studies is required for a larger comparison of outcomes between ultralight and heavy weight mesh used in inguinal hernioplasty.

Conflicts of interest:

There are no conflicts of interest.

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