COMPARATIVE STUDY BETWEEN LIGHTWEIGHT MESH AND STANDARD PROLENE MESH IN LICHTENSTEIN HERNIA REPAIR

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ABSTRACT

BACKGROUND

Inguinal hernia repair is the most frequently performed operation in any general surgical unit. Reports on the outcome of inguinal hernia surgery show that recurrence rate 5 years after operation can vary from 0.1 to over 20%. With Lichtenstein's hernioplasty, recurrence rate has come down to <2%. The trend changed in the early and mid 1990's in parallel with increasing number of case reports reporting mesh related complication after heavy mesh-based hernia repair such as seromas, discomfort, decreased abdominal wall mobility which are frequently observed post mesh hernioplasty.

The aim of the present study is to compare lightweight mesh with standard prolene mesh in Lichtenstein's hernia repair with respect to recurrence, serum, wound infection chronic pain and foreign body sensation at 1, 6 and 12 months follow-up and time taken to return to normal activity.

MATERIALS AND METHODS

A non-randomised controlled trial of 150 patients was undertaken. Patients were divided into two groups, of which 75 patients with primary lateral inguinal hernia were subjected to lightweight mesh Lichtenstein's hernioplasty and 75 to standard prolene mesh Lichtenstein's hernioplasty. All the hernia repairs were performed under spinal anaesthesia. In case of any associated conditions like hypertension and diabetes mellitus were present, treatment was first given for these associated conditions. The patients were followed in the surgical OPD at 1st month, 6th month and 1 year for time taken to return to normal activities, chronic groin pain, foreign body sensation, seroma formation and recurrence.

RESULTS

Chronic pain among patients in standard prolene mesh group at 1st month, 6th month and 1-year follow-up was seen in 40%, 26.6% and 8% of the patients respectively. And chronic pain as seen in lightweight mesh group patients at 1st month, 6th month and 1-year follow-up was 20%, 9.33% and none at 1 year respectively. Foreign body sensation in the lightweight mesh group is significantly less compared to patients in standard prolene mesh group. There was no recurrence in both groups. Time to return to work was relatively shorter among patients in lightweight mesh group.

CONCLUSION

Use of lightweight mesh and standard prolene mesh in Lichtenstein's repair of inguinal hernia are both comparable and effective. Lightweight mesh with lesser amount of foreign body causes, less foreign body reaction and thus less chronic pain, lesser foreign body sensation and earlier return to normal activities, whereas recurrence is similar in both the groups. Thus, Lichtenstein's hernioplasty with lightweight mesh is an ideal choice whenever feasible.

KEY WORDS

Inguinal Hernia, Prolene Mesh, Lightweight Mesh, Tension Free Repair, Heavy Weight Mesh, Macro Porous Mesh, UltraPro Mesh, Vypro Mesh, Lightweight Mesh versus Standard Prolene Mesh, Lichtenstein's Hernia Repair.

HOW TO CITE THIS ARTICLE: Dhotre M, Shanmukhappa S. Comparative study between lightweight mesh and standard prolene mesh in Lichtenstein hernia repair. J. Evolution Med. Dent. Sci. 2018;7(30):3394-3400, DOI: 10.14260/jemds/2018/766

BACKGROUND

This non-randomised controlled trial of inguinal hernias are one of the most common surgical conditions faced by surgeons over the years. Bassini's repair was developed in the late 19th century and revolutionary at the time for low recurrence rates compared to the previous standard of care procedures.

'Financial or Other Competing Interest': None.
Submission 03-07-2018, Peer Review 15-07-2018,
Acceptance 18-07-2018, Published 23-07-2018.
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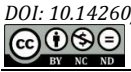
DOI: 10.14260/jemds/2018/766



It involved Bassini's triple layer (Internal oblique, transverse abdominis, fascia transversalis) to inguinal ligament with interrupted sutures with recurrence rates of 5 to 15%.[1] Shouldice repair achieved recurrence rate below 2% at the hands of its originators, but failed to gain widespread acceptance due to its technical difficulties and inconsistent results outside shouldice clinic.[2] The implantation of mesh and the resultant inflammatory reaction may also lead to the formation of a rigid scar plate with loss of abdominal wall pliability and changes in abdominal wall compliance, patients may complain of a sensation stiffness, physical discomfort and limitations in activities of daily living.

Lightweight meshes with reduced polypropylene content and larger pore size have demonstrated reduced inflammation and improved integration in surrounding tissues. They are also associated with decreased complaints of pain, paraesthesia and improved abdominal wall compliance while providing adequate strength.

Objectives

To compare lightweight mesh with standard prolene mesh in Lichtenstein hernia repair with respect to recurrence, seroma, wound infection chronic pain and foreign body sensation and time taken to return to normal work at 1, 6 and 12 months follow-up.

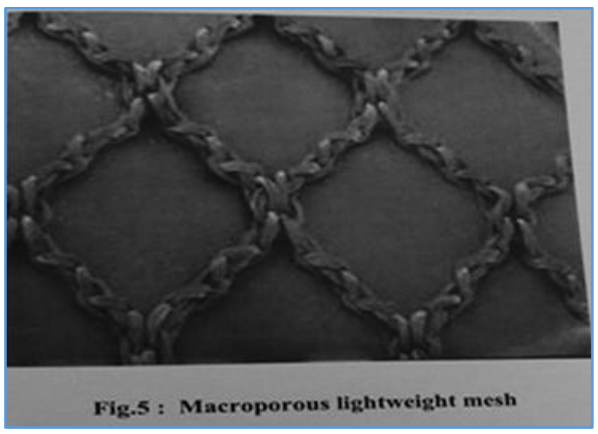


Fig.5 : Macroporous lightweight mesh

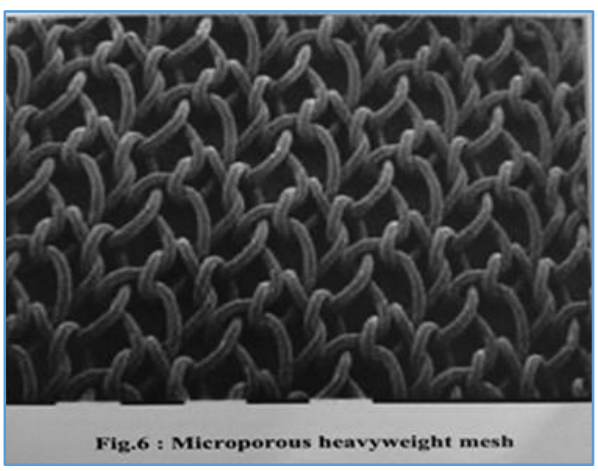


Fig.6 : Microporous heavyweight mesh

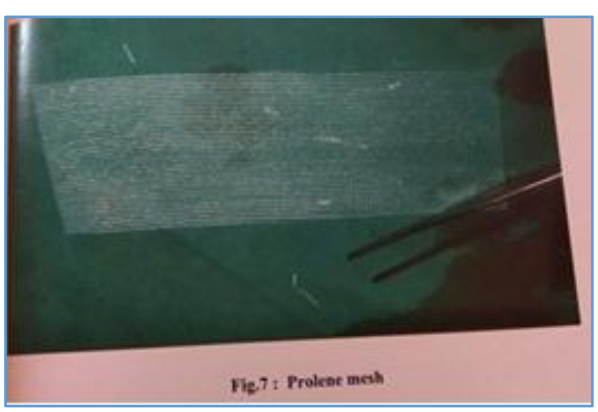


Fig.7 : Prolene mesh

Fig.8 : Ultrapro mesh

MATERIALS AND METHODS

This non-randomised controlled trial of total 150 patients were taken and divided into two groups, of which 75 patients with primary lateral inguinal hernia were subjected to lightweight mesh Lichtenstein's hernioplasty and 75 to standard prolene mesh Lichtenstein's hernioplasty in Chigateri General Hospital and Bapuji Hospital attached to JJM Medical College from June 2010 to June 2012. The patients admitted were subjected to Lightweight mesh (UltraPro) Lichtenstein's hernia. The patients admitted were subjected to standard prolene mesh Lichtenstein's hernia repair. The diagnosis of unilateral primary inguinal hernia was made on the basis of history of reducible groin swelling and essentially on clinical examination.

Only those investigations were done, which were relevant to obtain fitness for surgery. This included random blood sugar, blood urea, serum creatinine, ECG, Haemoglobin percentage and routine urine analysis for sugar, albumin and microscopy, chest x-ray and ultrasound abdomen. If any patient was found to have any medical contradiction for surgery, he was first treated for these medical problems and then re-evaluated for surgery.

All cases were done under spinal anaesthesia using 3 mL of bupivacaine 2% (Sensorcaine).

Patients admitted in the surgical wards were included in the study without bias on a serial basis. This is a comparative study comprising 75 patients of Inguinal Hernia, which was taken for convenience.

Since the calculated sample size was too high and thereby not feasible to include in this limited period of study, we had to limit the sample size for convenience.

Inclusion Criteria

- Men (20 yrs. or older) with unilateral primary inguinal hernias.
- Patients who gave consent for the procedure.

Exclusion Criteria

- Recurrent hernias.
- Presence of bowel obstructions, strangulation, peritonitis or perforation.
- Associated femoral hernia.
- Patients undergoing orchidectomy in the same procedure.
- Patients medically unfit for surgery.

Patients who refused investigations and any kind of surgical procedures were excluded.

Statistical Analysis

Statistical analysis was performed using the SPSS 16.0 (Statistical Package for the Social Science for windows; Version 16.0, SPSS Inc., Chicago, USA). Results were analysed using student's t-test for categorical variables and Chi-square test was used. Qualitative variables were analysed using proportions. Quantitative variables were analysed using mean and standard deviation. 'P' value less than 0.05 was considered statistically significant.

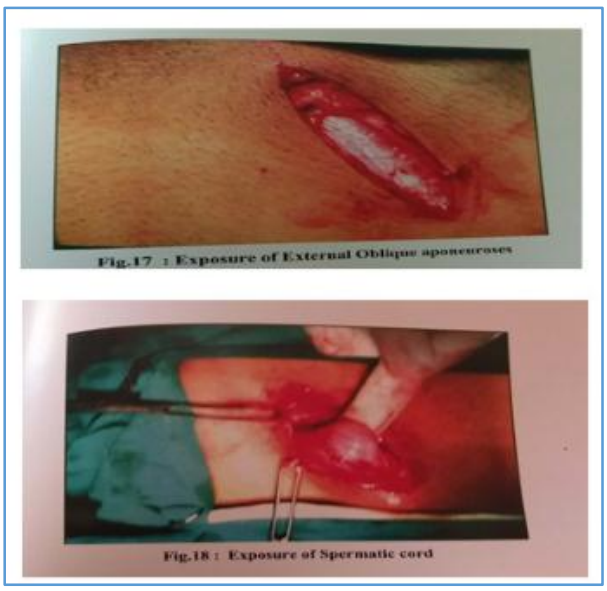


Fig.17 : Exposure of External Oblique aponeuroses

Fig.18 : Exposure of Spermatic cord

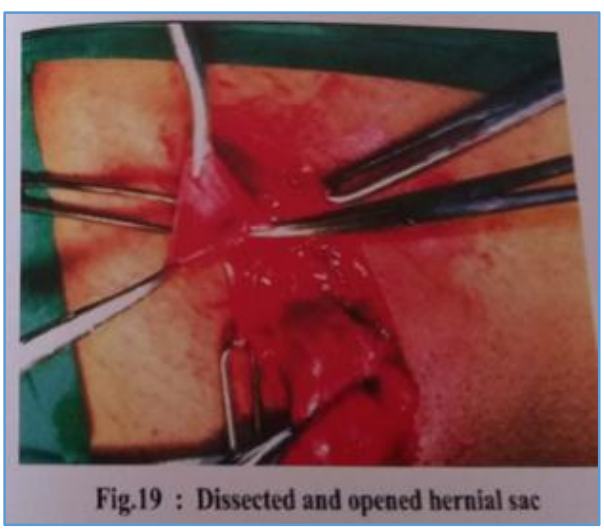


Fig.19 : Dissected and opened hernial sac


Fig.20 : Twisting to reduce contents of hernial sac

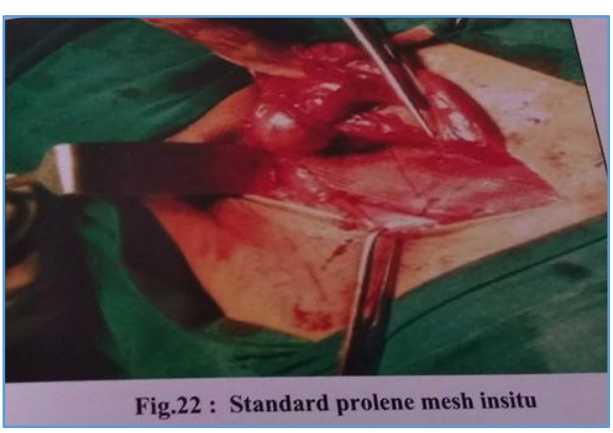


Fig.22 : Standard prolene mesh insitu

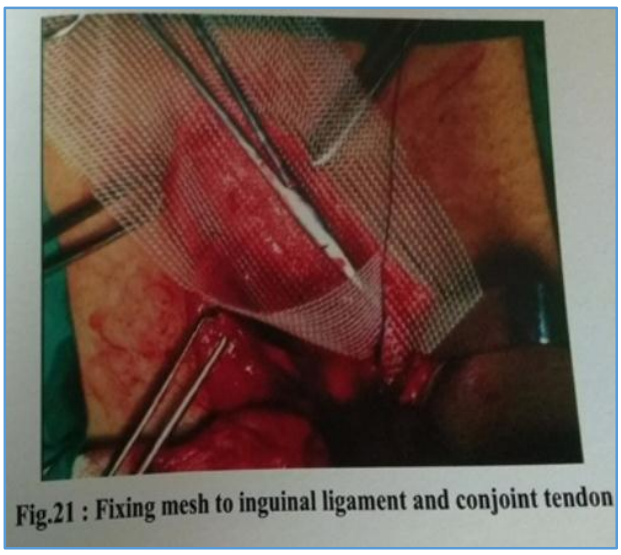


Fig.21 : Fixing mesh to inguinal ligament and conjoint tendon


Fig.23 : Ultrapro mesh insitu

RESULTS

The present study was carried out in the Department of Surgery in Chigateri General Hospital and Bapuji Hospital attached to JJM Medical College at Davangere. 150 cases of unilateral primary inguinal hernia were included in the study after taking their consent. They were subjected to Lightweight mesh or standard prolene mesh Lichtenstein's hernia repair. Evaluation of all the patients included in the study was done regarding the history, physical findings, operative findings and post-operative complications. 75 underwent repair with lightweight mesh Lichtenstein's repair and 75 underwent repair with standard prolene mesh Lichtenstein's hernia repair. All the cases in both the groups were followed for a period of one year. The patients were followed up at 1st month, 6th month and one-year interval for any complication or recurrence. Any recurrence of hernia was considered an end point.

The following observations were made during the course of the study.

Age Group (yrs.)	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
20-29	9(12)	26(34.66)
30-39	8(10.67)	8(10.67)
40-49	10(13.33)	6(8)
50-59	18(24)	9(12)
60-69	20(26.67)	18(24)
70+	10(13.33)	8(10.67)
Total	**75**	**75**

Table 1. Comparison of Age Wise distribution of Cases

Symptoms	Standard Prolene n (%)	Lightweight Mesh n (%)
Swelling	75(100)	75(100)
Pain	40(53.33)	36(48)
Table 2. Comparison of associated Symptoms		

In both the groups, all patients presented with swelling in the groin (100%) and pain was present in 36 cases (48%) of patients in lightweight mesh group and 40 (53.33%) of patients in standard prolene mesh group.

Swelling

Duration	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
< 1 month	-	3 (4)
1-6 months	30(40)	33 (44)
6-12 months	3(4)	3 (4)
12 months - 2 years	12(16)	21 (28)
2 years +	30(40)	15 (20)
Total	**75(100)**	**75 (100)**
Table 3. Comparison of Duration of Symptoms		

Range 1 month - 6 years, 15 days - 4 years

Pain

Duration	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
< 1 month	-	8
1-6 months	19	25
6-12 months	9	-
12 months - 2 years	6	-
2 years+	6	3
Total	**40**	**36**

Range 1 month - 6 years, 15 days - 4 years.

A majority of patients in both groups presented with duration of swelling for 1 - 6 months. Similarly, majority of the patients in both groups presented with duration of pain of 1 - 6 months.

	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
Right	49(65.33%)	56(74.67)
Left	26(34.67%)	19(25.33)
Total	75(100)	75(100)
Table 4(a). Comparison of Side Affected		

Numbers in parenthesis indicates numbers.

The majority of inguinal hernias in both the groups were right-sided.

	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
Direct	23(30.67)	19(25.33)
Indirect	52(69.33)	56(74.67)
Total	**75(100)**	**75(100)**
Table 4(b). Comparison of Direct/ Indirect Sac		

Numbers in parenthesis indicates numbers.

The majority of inguinal hernias in both the groups were right-sided.

Associated Factors	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
Smoker	18 (24)	18 (24)
Benign Enlargement of Prostate (BEP)	3 (4)	3 (4)
Bronchitis + BEP	3 (4)	3 (4)
Diabetes Mellitus	6 (8)	9 (12)
Hypertension (HTN)	6 (8)	6 (8)
Bronchial Asthma	-	3 (4)
HTN + BEP	-	3 (4)
Smoker, Urethral Stricture	-	3 (4)
NIL	39 (52)	27 (36)
Total	75 (100)	75 (100)
Table 5. Comparison of Associated Factors		

Numbers in parenthesis indicates numbers.

The most common factor associated with inguinal hernia in both the groups was smoking accounting for 24% of them.

	Standard Prolene Mesh				Lightweight Mesh				Fisher's Exact Test (P-value)
	No Pain (N)	Mild Pain (m)	Moderate Pain (M)	Severe Pain (S)	No Pain (N)	Mild Pain (m)	Moderate Pain (M)	Severe Pain (S)	
Post-op Day 7	40(53.33)	30(40)	5(6.67)	-	45(60)	25(33.33)	5(6.67)	-	0.7041 Not significant
Table 6. Comparison of Pain on Post-Operative Day 7									

Numbers in parenthesis indicates numbers.

There is no significant difference between lightweight mesh group and standard prolene mesh group with respect to pain at post-op 7.

	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)
Haematoma	3(4)	4(5.33)
Seroma	3(4)	2(2.67)
Infection	3(4)	6(8)
Normal	66(88)	63(84)
Total	**75 (100)**	**75 (100)**
Table 7. Comparison of Post-Operative Complications on Day-7 - Haematoma/Seroma/Wound Infection		

Numbers in parenthesis indicates numbers.

	Standard Prolene Mesh				Lightweight Mesh				Fisher's Exact Test (p-value
	No Pain (N)	Mild Pain (m)	Moderate pain (M)	Severe pain (S)	No Pain (N)	Mild pain (m)	Moderate pain (M)	Severe pain (S)	
1st month	45(60)	30(40)	-	-	60(80)	15(20)	-	-	0.0122(S)
6th month	55(73.33)	20(26.67)	-	-	68(90.66)	7(9.33)	-	-	0.0024(S)
1 year	69(92)	6(8)	-	-	75(100)	-	-	-	0.0282(S)

Table 8. Comparison of Chronic Pain

Numbers in parenthesis indicates numbers.

Chronic pain is significantly less in the lightweight mesh group patients compared with standard prolene mesh patients at 1st month, 6th month and 1-year post surgery.

Groups	Range (Days)	Mean ± SD	t*	P
Standard prolene mesh	11-35 days	15.85±4.54	2.8083	<0.0057, HS
Light-weight mesh	11-30 days	13.97±3.61		

Table 9. Comparison of Time Taken to Resume Normal Activities or Convalescence Period

*Unpaired t-test.

Time taken to resume normal activities was significantly less in case of light weight hernioplasty as compared to standard prolene mesh hernioplasty.

	Standard Prolene Mesh		Lightweight Mesh	
	Yes	No	Yes	No
1 month	-	75(100)	-	75(100)
6 months	-	75(100)	-	75(100)
1 year	-	75(100)	-	75(100)

Table 10. Comparison of Recurrence

Numbers in parenthesis indicates numbers.

None of the patients in both the mesh groups had any recurrences during the follow-up period.

	Standard Prolene Mesh n (%)	Lightweight Mesh n (%)	Chi-Square Value	P-value
Yes	22 (29.33)	8 (10.67)	8.17	<0.01
No	53 (70.67)	67 (89.33)		

Table 11. Comparison of Foreign Body Sensation

Numbers in parenthesis indicates numbers.

P value < 0.01 indicates foreign body sensation in the lightweight mesh group is significantly less compared to the foreign body sensation in standard prolene mesh group.

	Standard Prolene Mesh		Lightweight Mesh		Chi-Square Value	P-value
	Yes (%)	No (%)	Yes (%)	No (%)		
1 month	3(4)	72(96)	2(2.67)	73(97.33)	0.2069	0.6492(NS)
6 months	0(0)	75(100)	0(0)	75(100)		
1 year	0(0)	75(100)	0(0)	75(100)		

Table 12. Comparison of Seroma Formation

Numbers in parenthesis indicates numbers.

There is no significant difference in seroma formation between standard prolene mesh group and lightweight mesh group at 1st month, 6th month and 1-year follow-up.

DISCUSSION

All inguinal hernias share the common feature of emerging through the myopectineal orifice of Fruchaud, the opening in the lower abdominal wall bounded above by the myoaponeurotic arch of the lower edges of the internal oblique and the transverse abdominis muscle and below by the pectineal line of the superior pubic ramus.

Inguinal hernia surgeries are one of the most frequently performed operations in general surgery and as such even minor alterations in the outcome have appreciable impact. As surgeons we want techniques with short learning curves, but we still want to attain results comparable to the specialist hernia surgeons.

Our patients on the other hand want their period of convalescence and rehabilitation to be uncomplicated in both short- and long-term outcome, so as to return to their normal daily activities. They need less pain and better quality of life post-operatively with minimal surgical morbidity in the long term.

Currently, Two Major Techniques of Hernia Repair Exist-

- Pure tissue repairs.
- Tension free or mesh repairs.

The present comparative study is a small study and follow-up is limited for a period of one year. Therefore, there is a limitation to the study.

Recurrence

In this study during the period of one-year follow-up there was not even a single case of recurrence in both mesh repair groups.

Study	Standard Prolene Mesh		Study	Lightweight Mesh	
	Follow-Up	Recurrence (%)		Follow-Up	Recurrence (%)
S Bringman et al[3]	3rd year	9 (3.7)	S Bringman et al	3rd year	9 (3.6)
PJO Dwyer et al[4]	1 year	1 (0.7)	PJO Dwyer et al	1 year	8 (5.6)
M Smietanski et al[5]	1 year	1 (0.6)	M Smietanski et al	1 year	4 (1.9)
S Post et al[6]	6 months	2 (4.2)	S Post et al	6 months	2 (3.4)
Present Study	1 year	0	Present Study	1 year	0

Table 13. Recurrence Rate compared with Other Studies

The recurrence rate in the present study is comparable with other studies.

Chronic Pain

In the present study, follow-up of standard prolene mesh group patients revealed that 45 (60%) patients had no pain and 30 (40%) patients had mild pain at 1st month, 55 (73.33%) patients had no pain and 20 (26.67%) patients had mild pain at 6th month and 69 (92%) patients had no pain and 6 (8%) patients had mild pain at 1 year follow-up period.

Follow-up of lightweight mesh group patients revealed that 60 (80%) patients had no pain and 15 (20%) patients had mild pain at 1st month, 68 (90.67%) patients had no pain and 7 (9.33%) patients had mild pain at 6th month and 75 (100%) patients had no pain at 1 year follow-up period.

Study	Standard Prolene Mesh		Study	Lightweight Mesh	
	Follow-Up	Recurrence (%)		Follow-Up	Recurrence (%)
S Bringman et al[3]	3 year	3.3%	S Bringman et al	3 year	0.8%
PJO Dwyer et al[4]	1 month 3 month	81.8% 56.6%	PJO Dwyer et al	1 month 3 month	82.1% 56.8%
M Smietanski et al[5]	7 days 3 months 6 months 12 months	55.2% 17.1% 9.9% 6.2%	M Smietanski et al	7 days 3 months 6 months 12 months	36.2% 9.8% 10.7% 3.8%
Present Study	7 days 1 month 6 months 12 months	46.67% 40% 26.67% 8%	Present Study	7 days 1 month 6 months 12 months	40% 20% 9.33% 0%

Table 14. Chronic Pain compared with Other Studies

Time to Return to Normal Activity

Return to normal activities and work can be dependent on nutritional status of the patient. Malnourished patients are likely to have longer periods of convalescence.

In the present study, standard prolene mesh group patient's range is 11 - 35 days with mean value of 15.85 days and lightweight mesh group range being 11 - 30 days with mean value of 13.97 days.

It should be noted that desk workers will usually return to work earlier than manual workers. Time taken to work may also be dependent on financial incentives a patient gets at place of work.

Study	Standard Prolene Mesh(T)	Study	Lightweight Mesh (T)
PJO Dwyer et al[4]	26 days	PJO Dwyer et al[4]	21 days
Present Study	15.85 days	Present Study	13.97 days

Table 15. Time Taken to reduce Normal Activities (Convalescence Period) compared with Other Studies

Foreign Body Sensation

It is understood that lightweight mesh with less amount of foreign body causes less reaction and less body sensation. In this study, 22 people in the standard prolene mesh group had foreign body sensation compared to 8 people in lightweight mesh group.

Study	Standard Prolene Mesh (%)	Study	Lightweight Mesh (%)
S Bringman et al[3]	55 (22.6%)	S Bringman et al	37 (14.7%)
S Post et al[6]	21 (43.8%)	S Post et al	10 (17.2%)
Present Study	22 (29.33%)	Present study	8 (10.67%)

Table 16. Foreign Body Sensation compared with Other Studies

Foreign body sensation is in the present study comparable to other studies.

CONCLUSION

Use of lightweight mesh and standard prolene mesh in Lichtenstein's repair of inguinal hernia are both comparable and effective lightweight mesh with lesser amount of foreign body causes less foreign body reaction and thus less chronic pain, lesser foreign body sensation and earlier return to normal activities, whereas recurrence is similar in both the groups. Seroma formation, immediate pain, wound infection and haematoma is not affected but the type of mesh used. Lichtenstein's inguinal hernioplasty with lightweight mesh is an ideal choice whenever it is feasible.

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