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Comparative study between lightweight mesh and standard prolene mesh in lichtenstein hernia repair

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Abstract
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 of stiffness, physical discomfort, and limitations in activities of daily living. The patients admitted in general hospital were subjected to Lightweight mesh (ULTRAPRO) lichtenstein's hernia repair supplied free of cost by the government. The patients admitted in another hospital were subjected to standard prolene mesh lichtenstein's hernia repair. Time taken to resume normal activities was significantly less in case Light weight hernioplasty as compared to Standard prolene mesh hernioplasty.

Keywords: Lightweight mesh, standard Prolene mesh, lichtenstein hernia repair

Introduction
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 was revolutionary at the time for low recurrence rates compared to the previous standard of care procedures. 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].
Mcvays repair with similar recurrence rate involves suturing of triple layer to Coopers ligament. 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].
In 1986, the tension free inguinal hernia repair with mesh was described by Lichtenstein. Lichtenstein repair has become the most popular open technique for inguinal hernia repair and has been shown to have superior recurrence rates, simplicity of repair, and the decreased post operative pain when compared with tissue based hernia repair [3]
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 of stiffness, physical discomfort, and limitations in activities of daily living [4].
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.

Methodology
The patients admitted in general hospital were subjected to Lightweight mesh (ULTRAPRO) lichtenstein's hernia repair supplied free of cost by the government. The patients admitted in another hospital were subjected to standard prolene mesh lichtenstein's hernia repair. The diagnosis of unilateral primary inguinal hernia was made on 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, hemoglobin percentage and routine urine analysis for sugar, albumin and microscopy, chest x-ray and ultra sound abdomen.

If any patient was found to have any medical contraindication for surgery, he was first treated for these medical problems and then reevaluated for surgery. All cases were done under Spinal anesthesia using 3 ml of bupivacaine 2% (Sensorcaine). For Lightweight mesh a 2.4" x 4.3" (6cm x 11cm) by Ethicon Company was used. The mesh has pore size of density of 28g/m^2. It is sterilized by Ethylene oxide Polypropylene 2-0 was used to suture the mesh in place.

Similarly for standard prolene mesh hernia repair, prolene mesh of 2.4" x 4.3" made by ethicon company was used. The mesh has pore size of less than 1mm and has a density of 80-85g/m^2. It is sterilized by Ethylene oxide gas by the manufacturer. polypropylene 2-0 was used to suture the mesh in place. A shot of inj. Cefotaxime 1 g was given intravenously immediately before surgery. The note was taken of the contents of the sac, duration of surgery and any technical difficulty encountered during the surgery. Postoperatively patient was put on Inj. Cefotaxime 1 g BD intravenously for five days and injection diclofenac 75 mg im. BD for 3 days with one shot of Inj. diclofenac being given 3 hrs after surgery (evening dose).

The patients were followed up for postoperative pain which was evaluated using Visual Analogue Scale, wound hematoma, wound seroma, wound infection.

Patients were assessed for postoperative pain using Visual Analogue Scale on 7 th day after surgery. Visual Analogue Scale consists of a 10 cm line anchored at one end by a label as no pain and at the other end by a label such a severest pain patient experienced in his life time. We translated this for documentation as 1-3 mild pain, 3-7 moderate pain, 7-10 severe pain. Sutures were removed on the 7th postoperative day and the patients discharged if there was no wound infection, were ambulatory, were taking orally and felt comfortable. Patients were called to the out patient department and follow up was done at 1, 6 and 12th month for complications like chronic groin pain (inguinodynia), foreign body sensation and recurrence. Time taken to return to normal activity was enquired during their follow up visit.

Time to return to normal activity

All patients were encouraged to return to work as soon as possible, patient in both the groups were followed and the post operative time period that elapsed between day of surgery and the day of joining of duty at their work place was recorded and compared.

Recurrence

Patients were followed for recurrence. Recurrence was defined as clinically manifest bulge or a protrusion exacerbated by valsalva manoeuvre in the operated groin.

Technique for Lichtenstein Hernioplasty

After thoroughly painting with Betadine 5% v/v, drapes were put.

A 5 cm incision was made starting from the pubic tubercle medially to the position of the internal ring laterally. The skin incision was deepened. The External oblique aponeuroses was opened and its lower leaf freed from the spermatic cord. The upper leaf of External oblique was freed from the underlying Internal Oblique muscle and aponeuroses. The spermatic cord was mobilized by hooking an index finger around it near pubic tubercle. A thorough search was made for any direct sac. If present, the direct sac was inverted and imbricated using a nonabsorbable suture (Prolene 2-0) to flatten the posterior wall. The cremasteric sheath was incised longitudinally and the cord structures separated out and a search for any indirect sac was made.

The indirect sac, if found, was freed from the cord to a point beyond the neck of the sac. The sac was opened. Any contents of peritoneal cavity present were reduced by twisting the sac. The sac was then transligated and excised. To minimize the risk of postoperative ischaemic orchitis, complete nonsliding scrotal hernia sacs were transected at the midpoint of the canal, leaving the distal section in place.

A sheet of 2.4”×4.3” polypropylene (prolene) or lightweight (ultrapro) onlay mesh was sutured with polypropylene 2-0 continuous sutures into place. The medial end of the mesh was cut out to the shape of the medial corner of the inguinal canal. The inferomedial border of the mesh was sutured to the soft tissues overlying Pubic Tubercle after obtaining 2-3 cm of overlap here. The periosteum of the bone was avoided.

The inferior border of the mesh was attached to the inguinal ligament with a loose continuous polypropylene suture. A slit was made at the lateral end of the mesh, creating two tails, a wider above and a narrower below. A 3 mm circular piece of mesh was removed at the medial end of the slit for positioning the cord. The wider upper tail was passed around the cord, and was sutured along with the narrower tail to the inguinal ligament with loose continuous suture. Similarly the upper end of mesh was sutured to conjoined tendon.

During the procedure every care was taken to prevent entrapment of ilioinguinal as well as iliohypogastric nerves in the sutures.

The External Oblique aponeuroses was closed using Prolene 2-0 and skin closed by interrupted sutures with Ethylon 2-0.

Results

Table 1: Comparison of Pain on Post-Operative Day 7

		Standard prolene mesh				Light weight mesh			Fisher's Exact Test P value
	N No pain	m Mild pain	M Moderate pain	S Severe pain	N No pain	m Mild pain	M Moderate pain	S Severe pain	
Post Op day 7	40 (53.33)	30 (40)	5 (6.67)	-	45 (60)	25 (33.33)	5 (6.67)	-	0.7041 Not significant

Numbers in parenthesis indicate percentages.

There is no significant difference between light weight mesh group and standard prolene mesh group with respect to pain at post op day 7

Table 2: Comparison O F Posto Perativ E Compl Ication S on Day 7 – H Emato MA/ Seroma / WO UND Infection

	Standard prolenemesh n (%)	Light weightmesh n (%)
Hematoma	3 (4)	4 (5.33)
Seroma	3 (4)	2 (2.67)
Infection	3 (4)	6 (8)
Normal	66 (88)	63 (84)
Total	75 (1 00)	75 (100)

Numbers in parenthesis indicate percentages.

Table 3: Co Mparison of Chr Onic Pain

		Standard prolene mesh				Light weight mesh			Fisher's test P value
	N No pain	m Mild pain	M Moderate pain	S Severe pain	N No pain	m Mil d pain	M Moderate pain	S Severe pain	
1 month	45 (60)	30 (40)	-	-	6 0 (80)	15 (20)	-	-	0.0122 significant
6 month	55 (7 3.33)	20(26.6 7)	-	-	68 (90.66)	7(9.33)	-	-	0.0024 significant
I year	69(92)	6 (8)	-	-	75 (100)	-	-	-	0.0282 significant

Numbers in parenthesis indicate percentages.

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

Table 4: Comparison of Time Taken To Resume Normal Activities or Convalescence Period

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 * unpaired t-test	11 – 30 days	13.97 ± 3.61		

* unpaired t-test

Time taken to resume normal activities was significantly less in case Light weight hernioplasty as compared to Standard prolene mesh hernioplasty.

Table 5: Comparison of Recurrence

	Standard prolene mesh		Light weight mesh	
	Yes	No	Yes	No
1 month	-	75 (100)	-	75 (100)
6 months	-	75 (100)	-	75 (100)
1 year	-	75 (100)	-	75 (100)

Numbers in parenthesis indicate percentages.

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

Table 6: Compar Ison of F Oreign Body Sensation

	S tandard prol ene mesh n (%)	Light weight Mesh n (%)	Chi square value	P value
Yes	22 (29.33)	8 (10.67)	**8.17**	**< 0.01**
No	53 (70.67)	67 (8 9.33)		

Numbers in parenthesis indicate percentages.

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

Table 7: Comparison O F Serom A Form Ation

	Standard prolene mesh		Light weight mesh		Chi sq uare value	P value
	Yes (%)	No (%)	Yes (%)	No (%)		
1 month	3 (4)	72 (96)	2 (2.6 7)	73 (97.33)	0.2069	0.6492Not significant
6 month	0 (0)	75 (100)	0 (0)	75 (100)	-	-
1 year	0 (0)	75 (100)	0 (0)	75 (100)		-

Numbers in parenthesis indicate percentages.

There is no significant difference In seroma formation between standard prolene mesh group and light w eight mesh group at 1 month, 6month and 1 year follow up.

Discussion

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.

Table 8: Recurrence Rate Compared With Other Studies

	Standard prolene mesh			Light weight mesh	
Study	**Followup**	**Recurrence (%)**	**Study**	**Followup**	**Recurrence (%)**
S. Bringman *et al.* [5]	3 year	9 (3.7)	S. Bringman *et al.* [5]	3 year	9 (3.6)
P.J. O'Dwyer *et al.* [6]	1 year	1 (0.7)	P.J. O'Dwyer *et al.* [6]	1 year	8 (5.6)
M. Smietanski *et al.* [7]	1 year	1 (0.6)	M. Smietanski *et al.* [7]	1 year	4 (1.9)
S. Post *et al.* [8]	6 months	2 (4.2)	S. Post *et al.* [8]	6 months	2 (3.4)
Present study	1 yr	0	Present study	1 yr	0

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

Pain is difficult to measure objectively. Chronic pain following inguinal hernia repair is becoming a significant clinical problem affecting the quality of life. The exact incidence of chronic pain remains to be elucidated, varying in different series and only a few studies presenting long term follow up and a sufficiently large study population.

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 1 month, 55 (73.33%) patients had no pain and 20 (26.67%) patients had mild pain at 6 months and 69 (92%) patients had no pain and 6 (8%) patients had mild pain at 1 year follow up period.

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

Table 9: Chronic Pain Compared With Other Studies

Study	**Standard prolene mesh**		**Study**	**Light weight mesh**	
	Followup	**% having pain**		**Followup**	**% having pain**
S.Bringman *et al.* [5]	3 year	3.3%	S.Bringman *et al.* [5]	3 year	0.8%
P.J.O'Dwyer *et al.* [6]	1 mon 3 mon	81.8% 56.6%	P.J.O'Dwyer *et al.* [6]	1 mon 3 mon	82.1% 56.8%
M. Smietanski et al [7]	7 days 3 mon 6 mon 12 mon	55.2% 17.1% 9.9% 6.2%	M.Smietanski *et al.* [7]	7 days 3 mon 6 mon 12 mon	36.2% 9.8% 10.7% 3.8%
Present study	7 days 1 mon 6 mon 12 mon	46.67% 40% 26.67% 8%	Present study	7 days 1 mon 6 mon 12 mon	40% 20% 9.33% 0

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 patients range is 11 – 35 days with mean value of 15.85 days and Light weight mesh group range being 11 – 30 days with mean value 13.97 days. It should be noted that desk workers will usually return to work earlier than manual workers. Time taken to return to work may also be dependent on financial incentives a patient gets at place of work.

Table 10: Time Taken To Resume Normal Activities (Convalescence Period) Compared With Other Studies

Study	**Standard prolene mesh (T)**	**Study**	**Light weight mesh (T)**
P.J.O' Dwyer *et al.* [6]	26 days	P.J.O' Dwyer *et al.* [6]	21 days
Present study	15.85 days	Present study	13.97 days

Time taken to resume normal activities in the present study are comparable with the other study. It is understood that light weight mesh with less amount of foreign body causes less foreign body reaction and thus lesser foreign body sensation.

Conclusion

Use of Light weight mesh and standard prolene mesh in Lichtensteins repair of inguinal hernia are both comparable and effective. Light weight 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 where as recurrence is similar in both the groups. Seroma formation, immediate pain, wound infection, hematoma is not affected by the type of mesh used. Lichtenstein's inguinal hernioplasty with light weight mesh is an ideal choice whenever it is feasible.

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