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Difference in Resuming Mild to Moderate Work in Patients Undergoing Lichtenstein Mesh Repair of Inguinal Hernia Using Soft Prolene Mesh and Heavy Weight Prolene Mesh

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Abstract

Background: Hernia repair concept underwent a sea change with the introduction of monofilament knitted polyethylene plastic mesh in 1958 and later in 1962 of knitted, malleable PPM Prolene mesh.

Objective: To find out the difference between lightweight and standard polypropylene mesh for the repair of inguinal hernia by the Lichtenstein technique.

Methods: 60 Patients admitted in the surgery Department, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum with inguinal hernia requiring mesh repair were studied. The sample size was taken as 60, with 30 in study group and 30 in control group.

Results: During first follow up, all the patients in group SP reported moderate pain compared to 60% patients in group RP. ($p<0.001$). During second follow up, most of the patients (90%) in SP group reported mild pain compared to 26.67% patients in RP group ($p<0.001$). At the third follow up, all the patients (100%) in SP group reported mild pain compared to 53.33% patients in group RP. The mean pain scores in group SP during first (4.50±0.57 vs 5.97±1.07), second (2.30±0.88 vs 4.27±1.48) and third (0.63±0.72 vs 2.57±1.79) were significantly less compared to group RP ($p<0.001$) but mean reduction in pain score from first follow up to third follow up was comparable in group SP (3.90±0.97) and RP (3.40±1.33) ($p=0.092$).

Conclusions: lightweight macro-porous polypropylene mesh significantly minimise the post-operative pain in patients of lichensteins mesh repair for inguinal hernia as compared to heavyweight composite polypropylene mesh

Keywords: Lightweight macro-porous polypropylene mesh; Heavyweight composite polypropylene mesh; Lichensteins mesh repair; Inguinal hernia; Post operative pain.

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Introduction

Inguinal hernias may be congenital or acquired, with latter being the common presentation. Known risk factors are smoking, positive family history, patent processus vaginalis, collagen disease, previous appendicectomy (open) and prostatectomy, patients with ascites, peritoneal dialysis, after long term heavy work and COPD. It is interesting that occasional lifting, constipation and prostatism has not been proven to increase risk of inguinal hernias.[1]

American surgeon Francis Usher fabricated and developed both the materials. His innovations paved the way for advances that are accepted without question today. PPM remains most popular both in open and laparoscopic surgery. However, the first popular nonmetallic mesh was a machine knitted polyester polymer called Dacron.

The prosthesis used to reinforce the weakened posterior inguinal wall is placed between the transversalis fascia and the external oblique aponeurosis and extends well beyond the Hesselbach triangle. Mesh implants do not actively

shrink, but they are passively compressed by the natural process of wound healing. Shrinkage of mesh occurs only to the extent to which the tissue contracts.[2]

Although the use of traditional microporous or heavyweight polypropylene meshes in the last 2 decades have reduced the incidence of recurrence after hernia surgery to less than 1%, a major concern has been the formation of a rigid scar plate causing patient discomfort and chronic pain, impairing quality of life. More than 50% of patients with a large mesh prosthesis in the abdominal wall complain of paresthesia, palpable stiff edges of the mesh, and physical restriction of abdominal wall mobility.[3]

With regards to clinical features, typically, patient may present with either groin pain or swelling/lump. The presence of swelling/lump may be asymptomatic with respect to their activities of daily living. If symptomatic, they may be either minimally symptomatic (intermittent discomfort/pain) or symptomatic with interference with their activities of daily living. Furthermore they may present with incarceration where the hernia cannot be reduced into the abdominal cavity which may lead to strangulation or ileus.[1]

The advantage of large pore size mesh is that tissue is able to grow through the large pores of the mesh and create a thinner, more integrated scar. The new light-weight, composite meshes offer a combination of thinner filament size, larger pore size, reduced mass, and a percentage of absorbable material. Thus, there is less foreign body implanted, the scar tissue has greater flexibility (with almost physiologic abdominal wall mobility), there are fewer patient complaints, and the patient's quality of life is better.[2]

The use of light-weight mesh for Lichtenstein hernia repair did not affect recurrence rates, but it did improve some aspects of pain and discomfort 3 years after surgery.[4] According to data from current randomized, controlled trials and retrospective studies, light meshes seem to have some advantages with respect to postoperative pain and foreign body sensation.[1,5]

However, there is paucity of published data about the advantages of light weight macro-porous mesh in comparison with heavy weight mesh especially in India. Also, so far, no such study has been done in our hospital setting. Hence the present study was undertaken to find out the difference between lightweight and standard polypropylene mesh for the repair of inguinal hernia by the Lichtenstein technique.

Methods

This one year study was conducted in the General Surgery Department, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum attached to KLE University's J.N.M.C, Belgaum over a period one year from January 2012 to December 2012. The study was approved from the Ethical and Research Committee, Jawaharlal Nehru Medical College, Belgaum prior to the commencement.

60 Patients admitted with inguinal hernia requiring mesh repair were studied. The effect size is not available, hence the sample size was taken as 60, with 30 in study group (lightweight macro-porous – prolene soft) and 30 in control group (heavy weight composite prolene mesh).

Inclusion criteria: Patients with inguinal hernia undergoing mesh repair.

Exclusion criteria: Pregnancy, Subjects with pulmonary tuberculosis, Subjects with uncontrolled diabetes mellitus, Subjects with chronic cough, Subjects with strangulated/obstructed hernia.

Informed Consent: The patients fulfilling selection criteria were informed in detail about the nature of the study, especially the benefits of using the heavy weight and the light weight mesh in lichensteins mesh repair and a written informed consent was obtained.

Randomization: The patients were randomized by asking them to pick an opaque brown concealed envelop which furnished the information regarding the choice of mesh for their hernia repair. Based on the option picked up, two groups were made, each of 30 as below;

- Patients who selected prolene soft mesh (light-weight mesh) in lichensteins repair of inguinal hernia formed group SP (study group).
- Those who selected composite polypropylene mesh (Heavy-weight mesh) were assigned to group RP (control group).

Method of collection of data: Demographic data such as age, sex and history was obtained through an interview. Details such as duration, lump size were noted. Further these patients were subjected to clinical examination and the findings such as size, visible peristalsis, cough impulse, position were noted on a predesigned and pretested proforma.

Investigations: The following tests were subjected to the following investigations: Routine blood counts, Blood urea nitrogen, Serum creatinine, bleeding and clotting time, Urine Routine and Microscopy and chest X-ray and ECG.

Pain management: Post operatively patients of both the groups were given the same analgesics that is, Injection Diclofenac 50mg IM 1-0-1.

Outcome variables: Pain was assessed based on Visual Analogue Score ranging from 0 to 10 considering no pain as 0 and 10 as maximum pain.

Follow up: Patients were followed up at following intervals;

- From post operative 1week (before discharge)
- 2 weeks follow up
- 4 weeks follow up.

Statistical analysis: The data obtained was coded and entered in Microsoft Excel Spreadsheet. The data was showed as rates, ratios and percentages and comparison was done using Fishers exact test and chi-square test. Continuous data was expressed as mean ± standard deviation. A 'p' value of less than or equal to 0.05 was considered as statistically significant.

Results

In the present study 96.67% of patients in group SP and all (100%) in group RP were males. In the present study, group SP the mean age was 51.93 ± 18.73 years compared to 49.50 ± 14.03 years in group RP. However the difference was statistically not significant (p=0.571). In the present study the mean duration of the disease was 12.67 ± 9.85 months in group SP whereas in group RP it was 15.10 ± 8.98 months. However, this difference was statistically not significant (p=0.321).

In this study, the mean pulse rate in group SP and RP (79.60 ± 5.64 vs 82.37 ± 5.46 /min; p=0.059), systolic blood pressure (120.33 ± 9.99 vs 124.33 ± 11.94 mm Hg; p=0.165) and diastolic blood pressure (73.73 ± 6.76 vs 75.80 ± 8.59 mm Hg; p=0.305) were comparable. Table 1.

Table 1: Vitals.

Vitals	Group SP (n=30)		Group RP (n=30)		p value
	Mean	SD	Mean	SD	
Pulse rate (/min)	79.60	5.64	82.37	5.46	0.059
Systolic BP (mm Hg)	120.33	9.99	124.33	11.94	0.165
Diastolic BP (mm Hg)	73.73	6.76	75.80	8.59	0.305

In this study during first follow up, all the patients in group SP reported pain scores between 4 to 6 (moderate pain) compared to 60% patients in group RP and 40% of patients reported pain scores of > 7 (sever pain) in group RP. This difference was statistically significant (p<0.001). Table 2.

Table 2: VAS scores at first follow up.

VAS score	Group SP (n=30)		Group RP (n=30)	
	Number	Percentage	Number	Percentage
upto 3	0	0.00	0	0.00
4 to 6	30	100.00	18	60.00
7 or more	0	0.00	12	40.00
Total	30	100.00	30	100.00

p<0.001

In this study during second follow up, majority of the patients (90%) in group SP reported pain scores ≤ 3 (mild pain) compared to 26.67% patients in group RP. Pain score between 4 to 6 (moderate pain) were seen in 10% of patients in group SP compared to 66.67% of patients in group RP and 6.67% of patients reported pain scores of > 7 (severe pain) in group RP. This difference was statistically significant (p<0.001). Table 3.

Table 3: VAS scores at second follow up.

VAS score	Group SP (n=30)		Group RP (n=30)	
	Number	Percentage	Number	Percentage
upto 3	27	90.00	8	26.67
4 to 6	3	10.00	20	66.67
7 or more	0	0.00	2	6.67
Total	30	100.00	30	100.00

p<0.001

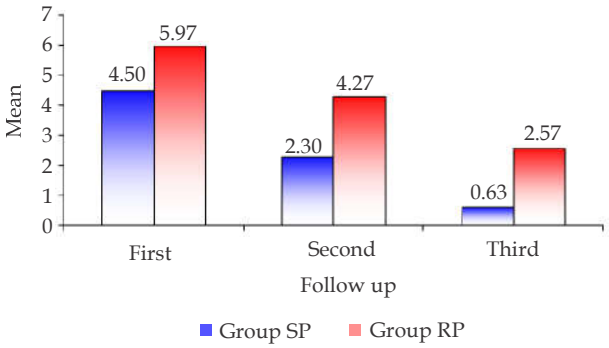
In the present study during third follow up, all the patients (100%) in group SP reported pain scores ≤ 3 (mild pain) compared to 53.33% patients in group RP. In group SP, 46.67% of patients had pain scores between 4 to 6 (moderate pain). This difference was statistically significant (p<0.001). Table 4.

Table 4: VAS scores at third follow up.

VAS score	Group SP (n=30)		Group RP (n=30)	
	Number	Percentage	Number	Percentage
upto 3	30	100.00	16	53.33
4 to 6	0	0.00	14	46.67
7 or more	0	0.00	0	0.00
Total	30	100.00	30	100.00

p < 0.001

The mean pain scores in group SP during first (4.50 ± 0.57 vs 5.97 ± 1.07), second (2.30 ± 0.88 vs 4.27 ± 1.48) and third (0.63 ± 0.72 vs 2.57 ± 1.79) were significantly less compared to group RP (p<0.001). Graph 1.



Graph 1: Mean VAS scores.

In this study, the mean reduction in pain score from first follow up to third follow up was comparable in group SP (3.90 ± 0.97) and RP (3.40 ± 1.33) (p=0.092). Table 5.

Table 5: Reduction Mean VAS scores from first week to third week.

Pain	Group SP (n=30)		Group RP (n=30)		p value
	Mean	SD	Mean	SD	
Mean reduction	3.90	0.97	3.40	1.33	0.092

Discussion

Studies investigating the influence of light-weight versus heavy-weight meshes on pain show a slight advantage towards light-weight meshes.[6]

Open tension-free mesh (Lichtenstein) hernioplasty, performed under local anesthesia, is a simple technique and trained surgical residents are able to perform it without compromising the patient's care and long-term outcome. The procedure is time tested, safe, and economical, as well as being quick and easy to perform. In addition, it carries fewer complications and has become the gold standard in open tension-free hernioplasties.[2]

Indeed, postoperative pain after a Lichtenstein hernioplasty is minimal; according to a meta-analysis of all reported randomized studies, the pain is comparable to that occurring after laparoscopic repair.[2]

In this study during first follow up, all the patients (100%) in group SP reported pain scores between 4 to 6 compared to 60% patients in group RP and 40% of patients reported pain scores of > 7 (sever pain) in group RP. Also, the mean pain scores were significantly less in group SP compared to group RP (4.50 ± 0.57 vs 5.97 ± 1.07; p<0.001). These findings suggest that, significantly higher number of patients who underwent lichensteins inguinal hernia repair under prolene soft mesh [light-weight mesh] had mild and/or moderate pain but in those who had lichensteins repair of inguinal hernia under polypropylene mesh (Heavy-weight mesh) had moderate and/or severe pain (p<0.001).

Similarly During second follow up, majority of the patients (90%) in group SP reported mild compared to 26.67% patients in group RP. The moderate in group RP was present in 66.67% of patients and 6.67% of patients reported severe pain (p<0.001). Also, the mean pain scores in group SP during second followed up were suggestive of mild pain (2.30 ± 0.88) compared to moderate pain in group RP (4.27 ± 1.48) and this difference was statistically significant (p<0.001). These findings showed significantly higher number of patients with mild pain in those who underwent Lichensteins repair of inguinal hernia under prolene soft mesh (light-weight mesh).

A the third follow up, all the patients (100%) in group SP reported mild pain compared to 53.33% of the patients in group RP. In the remaining, 46.67% of patients had moderate pain in group RP and this difference was statistically significant (p<0.001). Similarly the mean pain scores in group SP were suggestive of minimal pain (0.63 ± 0.72) compared to group RP (2.57 ± 1.79) (p<0.001). These findings suggest that, the patient who underwent Lichensteins repair of inguinal hernia under prolene soft mesh [light-weight mesh]) had very mild pain compared to those who had Lichensteins repair of inguinal hernia under polypropylene mesh (Heavy-weight mesh).

The concept of using a mesh to repair hernias was introduced over 50 years ago. Mesh repair is now standard in most countries and widely accepted as superior to primary suture repair. As a result, there has been a rapid growth in the variety of meshes available and choosing the appropriate one can be difficult.

Meshes are associated with a reduced risk of chronic pain compared to suture repair. This is thought to be related to the ability to use tension-free technique rather than the mesh itself. However, pain remains a serious complication of mesh repair and can occur for a variety of reasons. With regards to acute postoperative pain, there is little difference in the type of mesh used. Chronic pain following hernia repair has gained increased recognition, with a quoted risk of over 50%. When it starts in the immediate postoperative period, it is usually due to nerve damage at the time of operation. In contrast, pain due to foreign body reaction (FBR) typically presents after 1 year. Explants removed for chronic pain are found to have nerve fibres and fascicles around the foreign body granulomata

within the mesh. Neuromas can also be found at the interface of mesh and host tissue suggesting mechanical destruction of nerves by mesh. It follows that meshes with small pores and greater FBR, will cause higher rates of chronic pain. This is supported by most studies, although disputed by some. Some authors have also suggested that absorbable meshes may have a role in reducing chronic pain.[7]

According to data from current randomized, controlled trials and retrospective studies, light meshes seem to have some advantages with respect to postoperative pain and foreign body sensation.[8]

A randomized trial examined whether lightweight (LW) polypropylene mesh (large pore size, partially absorbable) could have long-term benefits in reducing chronic pain and inflammation after inguinal hernia repair. Study concluded that, use of LW mesh for Lichtenstein hernia repair improved some aspects of pain and discomfort 3 years after surgery.[8]

Post S et al found that, lightweight polypropylene mesh may be preferable for Lichtenstein repair of inguinal hernia.[9]

Smietanski M concluded that, use of lightweight mesh did not neither increase the recurrence rate nor reduce the incidence of severe pain. However study recommended that, lightweight meshes could be considered as a material of choice in primary inguinal hernioplasty.[10]

Zhong C found that, use of lightweight mesh in Lichtenstein inguinal hernia repair is associated with less chronic pain, and foreign body sensation compared with heavyweight mesh.[11]

Other Researcher revealed that, lightweight mesh repair do have advantages in terms of chronic postoperative pain and recommended further well-structured trials with improved standardization of hernia types, operative techniques are necessary.[12]

Conclusion

Overall, the present study showed that, the pain scores were significantly less in prolene soft mesh (lightweight macro-porous polypropylene mesh) group as compared to heavyweight composite polypropylene mesh group. Thus the use of prolene soft mesh is associated with a less foreign body reaction, reducing the scarplate formation and reducing the entrapment of nerves resulting in lowering the possibility of inguinodynia in post-operative patients of Lichensteins hernioplasty.

Based on the findings of the present study it may be concluded that, the the prolene soft mesh (lightweight macro-porous polypropylene mesh) significantly reduced the post-operative pain in patients undergoing lichensteins mesh repair for inguinal hernia as compared to heavyweight composite polypropylene mesh.

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Declarations

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