



Comparison of Heavy- and Light-Weight Composite Mesh in Pain Reduction Among Patients with Inguinal Hernia: A 1-Year Randomized Control Trial

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ABSTRACT

Background: Inguinal hernia is commonly addressed complication among men and women. Surgical mesh repair is widely used as a treatment. Postoperative chronic pain is a major complication and concern, as it restricts the patient's regular activities. **Objective:** To compare the heavy-weight polypropylene and the light-weight prolene mesh for the reduction of postoperative pain in patients undergoing Lichtenstein mesh repair of inguinal hernia. **Methodology:** This 1-year randomized study included 60 patients with inguinal hernia. They were divided into two equal groups ($n=30$)-light-weight prolene (SP-study group) and heavy-weight polypropylene mesh (RP-control group). Lichtenstein mesh repair surgery was performed on the patients according to the groups assigned. Postoperative pain was assessed based on visual analog score ranging from 0 to 10. Patients were followed up postoperative for the first, second, and third week. Microsoft Excel was used to enter the data and categorical data were expressed as rates, ratios and percentages. Data were compared using Fishers exact test and chi-square test. **Results:** During the first follow-up, all the patients in group SP reported moderate pain; however, 60% of patients in group RP reported pain ($p<0.001$). During second follow-up, majority of the patients (90%) in group SP reported mild pain compared to 26.67% patients in group RP ($p<0.001$). At the third follow-up, all the patients (100%) in group SP reported mild pain compared to 53.33% patients in group RP ($p<0.001$). **Conclusion:** The prolene light mesh significantly reduced the postoperative pain in patients undergoing Lichtenstein mesh repair for inguinal hernia as compared to heavy-weight mesh.

Keywords: Inguinal hernia, Lichtenstein mesh, prolene soft mesh

INTRODUCTION

Inguinal hernia affects the groin area when the intestinal or fatty tissues distend through the inguinal canal. The inguinal canal is positioned at the underline of the abdomen. Globally, 75% of all hernias in the abdominal walls are inguinal hernia. It is the most common complication confronted by general surgeons [1,2]. Inguinal hernia is generally acquired but rarely congenital. Increase in intra-abdominal pressure and also weakening of the abdominal wall leads to formation for inguinal hernia. The influence of smoking, collagen disease, family history, processus vaginalis, chronic obstructive pulmonary disease, and heavy weight lifting are some of the risk factors involved. Clinical manifestation involves either pain or lump or swelling in the groin region [3].

The management of inguinal hernia has been a challenge to the general surgeons. The choice of treatment is surgery, which varies from laparoscopic repair, nylon darn, shouldice repair or Lichtenstein mesh [4]. It was in the late 1930s that synthetic sutures were developed. Since then various improvements in terms of materials, tensile strength, different coatings, pores size etc. have been done. Over the years, sutures have evolved to mesh repair [5,6]. Nowadays, a variety of meshes with different properties are used to treat all sorts of hernias. Studies have reported lower reoccurrence (<5%) of inguinal hernia among patients treated with appropriate mesh repair [7].

Patients often suffer from postoperative complications in hernia repair, which includes severe pain, infections, and urine retention. Inguinodynia or chronic pain is widely studied issue in hernia repair. Chronic pain is attributed to nerve damage, which affects 0.5% to 6% of patient's daily routine activities [8]. In our study design, we have assessed two meshes-light-weight prolene mesh and heavy-weight polypropylene mesh in postoperative pain reduction in Lichtenstein mesh repair treatment for inguinal hernia.

METHODOLOGY

This 1-year, randomized, controlled trial was conducted at the Department of General Surgery, KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum from January 2012 to December 2012. Patients admitted with inguinal hernia requiring mesh repair were studied. Patients with pulmonary tuberculosis, uncontrolled diabetes mellitus, chronic cough, strangulated/obstructed hernia, and pregnant women were excluded from the studies. Ethical clearance was obtained from the Ethical and Research Committee, Jawaharlal Nehru Medical College, Belgaum before the commencement of study. A total of 60 patients were divided into two groups-30 in study group (light-weight macro-porous prolene mesh) and 30 in control group (heavy-weight composite polypropylene mesh).

Patients who underwent Lichtenstein repair of inguinal hernia with prolene mesh (light-weight mesh) formed group SP and patients who underwent Lichtenstein repair of inguinal hernia with polypropylene mesh (heavy-weight mesh) formed group RP. Demographic data such as age, sex, and history were obtained through an interview. Details such as duration and lump size were noted. Further, patients were subjected to clinical examination and findings such as size, visible peristalsis, cough impulse, and position. All the patients underwent the following tests:

- Routine blood counts-Hemoglobin, total leukocyte counts, differential counts, red blood cell counts, and erythrocyte sedimentation rate (ESR)
- Blood urea nitrogen level
- Serum creatinine level
- Bleeding and clotting time
- Urine routine and microscopy
- Chest X-ray and electrocardiogram (ECG)

Postoperatively, patients of both the groups were given the same analgesics-injection diclofenac 50 mg intramuscularly (1-0-1). Pain was assessed based on visual analog score (VAS) ranging from 0 to 10, considering 0 as no pain and 10 as maximum pain. Further the pain was divided into following categories:

- Mild pain: VAS score ≤ 3
- Moderate pain: VAS score between 4 and 6
- Severe pain: VAS score ≥ 7

Patients were followed up at 1 week (before discharge), 2 weeks, and 4 weeks. The data obtained were coded and entered in Microsoft Excel spreadsheet. Data were expressed as rates, ratios, and percentages and compared using Fishers exact test and chi-square test. Continuous data were expressed as mean \pm standard deviation. P-value 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 patients (100%) in group RP were men. The mean age of the patients in SP group was 51.93 ± 18.73 years compared to 49.50 ± 14.03 years in group RP. However, the difference was not statistically significant ($p=0.571$). The mean duration of the disease was 12.67 ± 9.85 and 15.10 ± 8.98 months in SP and RP groups, respectively ($p=0.321$). Right position of the inguinal hernia was more commonly addressed among both the groups, 56.67% and 50% in SP and RP groups, respectively. The mean pulse rate in group SP and RP was 79.60 ± 5.64 beats/min and 82.37 ± 5.46 beats/min; $p=0.059$, respectively. Systolic blood pressure (120.33 ± 9.99 vs 124.33 ± 11.94) mmHg; $p=0.165$) and diastolic blood pressure (73.73 ± 6.76 vs 75.80 ± 8.59) mmHg; $p=0.305$) were comparable.

During the first follow-up, all the patients in group SP and 60% patients in group RP reported pain scores between 4 and 6 (moderate pain). Pain scores of >7 (severe pain) was reported by 40% of the patients in group RP. Majority of the patients (90%) in group SP reported pain scores ≤ 3 (mild pain) compared to 26.67% patients in group RP during their second follow-up. Also, pain score between 4 and 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. In the third follow-up, all the patients (100%) in SP group and 53.33% in RP group reported pain score of ≤ 3 (mild pain). Pain score between 4 and 6 (moderate pain) was experienced by 46.67% of patients in SP group. Therefore, the mean pain scores of patients 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 those in group RP ($p < 0.001$). The mean reduction in pain score from first to third follow-up was comparable in group SP (3.90 ± 0.97) and RP (3.40 ± 1.33) at $p = 0.092$ (Table 1).

Table 1 Mean values of visual analog score

Follow up	Group SP (n=30) mean		Group RP (n=30) mean		p-value
	Mean	SD	Mean	SD	
First week	4.5	0.57	5.97	1.07	<0.001
Second week	2.3	0.88	4.27	1.48	<0.001
Third week	0.63	0.72	2.57	1.79	<0.001

DISCUSSION

Hernias are viscous protrusions from the cavity, which is usually present in the membrane-formed sac-like structure [9]. Studies have shown that among the groin hernias, 96% are inguinal and only 4% are femoral hernias, which occur in both men and women in the ratio 9:1 [10]. Also, 20% of all inguinal hernia is bilateral (hernia on either sides of pelvic region). Evidence-based inguinal hernia guidelines recommend Lichtenstein hernia repair in case of a primary unilateral inguinal hernia. In this repair, the inguinal floor is reinforced by means of mesh [11]. The reoccurrence of inguinal hernia has reduced to $< 5\%$ from 15% to 20% after hernia repair with mesh [12]. While choosing the mesh, the doctor needs to consider the perspective in which it is to be used. Light-weight monofilament meshes with large pores and minimum surface area were found to be more beneficial with minor risk of infections [13].

The present study was aimed to compare the heavy-weight composite polypropylene mesh versus the light-weight prolene mesh for the reduction of postoperative pain in patients undergoing Lichtenstein mesh repair for inguinal hernia. Literature suggests that usage of meshes reduce chronic pain when compared to sutures, which were introduced 50 years ago [13]. Lichtenstein is a simple tension-free technique mesh hernioplasty performed by experienced surgical doctors under local anesthesia. This procedure has been tested and is safe as well as economical [14].

Postoperative, 0.03% to 31% of the patients complain of chronic pain and other problems such as discomfort and lack of sensation [15,16]. Currently, among all the postoperative complications, chronic pain is considered the most important, as it limits patient's day to day activities. Previous studies reported that 20% of the patients complaining of pain even 3 months after operation and 12% of them suffer from severe pain, which restricts their lifestyle. Also, an invalidating pain is experienced by 1% to 3% after 1 year of operation [17]. Lichtenstein postoperative chronic pain was found to be minimal compared to laparoscopic repair [14].

In this study patients were asked to follow-up after 1, 2, and 3 weeks of the Lichtenstein mesh repair. During the first follow-up, the mean pain scores were significantly less in group SP compared to group RP (4.50 ± 0.57 vs 5.97 ± 1.07 ; $p < 0.001$). The mean pain scores in group SP during second follow-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 ($p < 0.001$). In third follow-up, the mean pain scores in group SP were suggestive of minimal pain (0.63 ± 0.72) compared to group RP (2.57 ± 1.79 ; $p < 0.001$). Findings suggest significantly higher number of patients who underwent Lichtenstein repair under prolene mesh (light-weight mesh) had mild and/or moderate pain but in those under polypropylene mesh (heavy-weight mesh) had moderate and/or severe pain ($p < 0.001$).

According to Rutkow, et al., light-weight meshes were advantageous in terms of unknown body sensation and chronic pain postoperative [10]. Benefits of low-weight mesh against standard mesh was studied in a randomized trial including 600 men diagnosed with unilateral inguinal hernia in terms of reducing chronic pain. Studies concluded that Lichtenstein repair showed improved aspects in terms of pain and discomfort [18]. In a similar study, 122 patients were re-examined for pain after 6 months of Lichtenstein repair. It was noticed that significantly a lesser pain was experienced on exercise ($p = 0.042$) [19].

In another study conducted by O' Dwyer, et al. to compare the pain in patients who have undergone inguinal hernia with absorbable light-weight and non-absorbable heavy-weight mesh at 1, 3 and 12 months. They studied 132 patients,

of which 162 treated with light-weight mesh and 159 with heavy-weight mesh. Fewer patients reported severe pain in absorbable light-weight mesh repair (39.5%) compare to heavy-weight mesh (51.6%) [20].

The results of the present study were in agreement with the other studies which showed the role of light-weight mesh in reducing immediate and long-term postoperative pain. However, interestingly 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 ; $p=0.092$), which again prompts the validation of light-weight mesh in the assessment of immediate pain following the Lichtenstein inguinal hernia repair. However, this disparity between the significantly lower pain scores and lack of significance in mean reduction in pain scores could be attributed to the smaller sample size.

CONCLUSION

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

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