

A Comparative Study of Early Postoperative Pain in Mesh Fixation and Non-Fixation During Open Lichtenstein Inguinal Hernioplasty: A Prospective Randomized Study

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ABSTRACT

Background: Open Lichtenstein tension-free mesh hernioplasty remains the gold standard procedure for inguinal hernia repair. Traditionally, mesh fixation using sutures is performed to secure the prosthesis. However, suture fixation may contribute to early postoperative pain due to tissue handling, nerve irritation, and inflammatory response. Recent surgical approaches suggest that non-fixation of mesh may reduce postoperative pain without increasing recurrence rates.

Aim: To compare early postoperative pain in patients undergoing open Lichtenstein mesh hernioplasty with mesh fixation versus without mesh fixation.

Methods: A prospective randomized controlled study was conducted in the Department of General Surgery at District Hospital, Kishtwar between August 2023 to August 2026. A total of 60 adult patients with primary unilateral inguinal hernia were randomized into two groups: (1) Group A: Mesh fixation (n=30); (2) Group B: Mesh without fixation (n=30). Postoperative pain was assessed using the Visual Analog Scale (VAS) at 12, 24, and 48 hours. Analgesic consumption and early complications were recorded. Statistical analysis was performed using Student's t-test and Chi-square test, with $p < 0.05$ considered significant.

Results: The non-fixation group demonstrated significantly lower mean VAS scores at 12, 24, 48 hours postoperatively ($p < 0.05$). Analgesic requirements were also significantly reduced in the non-fixation group. No statistically significant difference in early postoperative complications was observed between the two groups.

Conclusion: Omitting mesh fixation in open Lichtenstein hernioplasty significantly reduces early postoperative pain without increasing short-term complications. Non-fixation may be considered a safe and effective modification in selected patients.

Keywords: Inguinal hernia, Lichtenstein repair, mesh fixation, postoperative pain, non-fixation hernioplasty.

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Introduction

Inguinal hernia is one of the most common surgical conditions encountered in general surgical practice worldwide. It is estimated that approximately 20–27% of men and 3–6% of women will develop an inguinal hernia during their lifetime.

The introduction of tension-free mesh repair by Irving Lichtenstein in 1984 revolutionized inguinal hernia surgery. The open Lichtenstein tension-free mesh hernioplasty rapidly became the gold standard technique due to its simplicity, reproducibility, and remarkably low recurrence rates compared to tissue-based repairs. The fundamental principle of this method involves reinforcing the posterior wall of the inguinal canal using a synthetic mesh, typically polypropylene, without placing tension on native tissues.

Despite its success in reducing recurrence, attention has increasingly shifted toward postoperative quality outcomes, particularly pain. Early postoperative pain remains a significant concern following open inguinal hernia repair. Although often considered transient, acute postoperative pain can delay ambulation, prolong hospital stay, increase analgesic consumption, and negatively impact patient satisfaction. Furthermore, poorly controlled acute pain has been implicated as a risk factor for the development of chronic post-herniorrhaphy groin pain, a condition that may significantly impair long-term quality of life.

In the conventional Lichtenstein technique, the prosthetic mesh is secured using non-absorbable sutures to anatomical landmarks such as the inguinal ligament and the conjoint

tendon. While fixation ensures stability of the mesh and theoretically reduces the risk of displacement or recurrence, it introduces additional tissue trauma. Suturing may lead to compression, irritation, or entrapment of adjacent nerves including the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerve. This mechanical irritation, combined with local inflammatory response induced by suture material, is believed to contribute to increased nociceptive stimulation in the early postoperative period.

Recent advances in surgical understanding suggest that postoperative pain is multifactorial in nature. Several factors contribute to the development of pain following surgery, including the extent of tissue dissection and handling during the procedure, which can cause local tissue trauma. In addition, the placement of a surgical mesh may trigger a foreign body reaction, leading to inflammation and discomfort. Suture-related nerve irritation is another important factor, as sutures used for mesh fixation may entrap or irritate nearby nerves, resulting in pain. The release of local inflammatory mediators at the surgical site also contributes to the pain response during the postoperative period. Furthermore, individual variability in pain perception plays a significant role, as patients differ in their sensitivity and response to surgical trauma and inflammation.

Given these factors, the necessity of mesh fixation in all cases has been questioned. It has been hypothesized that once the mesh is properly positioned within the inguinal canal

and the external oblique aponeurosis is closed, intra-abdominal pressure may help maintain mesh placement without the need for additional sutures. This has led to the development of non-fixation techniques in open Lichtenstein hernioplasty.

The concept of mesh placement without fixation has been introduced with the aim of reducing surgical trauma, minimizing nerve irritation, and consequently decreasing early postoperative pain. By avoiding the use of sutures for mesh fixation, this technique reduces tissue penetration by sutures, which may otherwise contribute to tissue injury and postoperative discomfort. Additionally, the absence of sutures lowers the risk of nerve entrapment, a recognized cause of postoperative groin pain. Non-fixation of the mesh may also lead to a decreased inflammatory response at the surgical site, further contributing to reduced pain. Moreover, this technique can result in a shorter operative time, as the step of suturing the mesh is eliminated. Another potential advantage is cost-effectiveness, since fewer surgical materials and less operative time may reduce the overall cost of the procedure. However, concerns remain regarding possible mesh migration, folding, or displacement, particularly in large direct hernias where posterior wall support may be weak. Therefore, while non-fixation may offer improved postoperative comfort, its safety and efficacy must be carefully evaluated.

From a broader perspective, modern surgical practice increasingly aligns with Enhanced Recovery After Surgery (ERAS) protocols, which prioritize early mobilization, reduced opioid consumption, and improved patient-

centered outcomes. Minimizing early postoperative pain plays a critical role in achieving these objectives. If mesh non-fixation can reliably reduce acute pain without compromising surgical safety, it may represent a meaningful refinement of the standard Lichtenstein technique.

In this context, the present study aims to compare early postoperative pain in patients undergoing open Lichtenstein mesh hernioplasty with mesh fixation versus without fixation. By systematically evaluating pain scores, analgesic requirements, and early complications, this study seeks to contribute to the growing body of evidence regarding optimization of inguinal hernia repair techniques with a focus on patient comfort and functional recovery.

Aim and Objectives

Aim

To compare early postoperative pain in mesh fixation versus non-fixation in open Lichtenstein mesh hernioplasty.

Objectives

1. To measure early postoperative pain using VAS at 12, 24, and 48 hours.
2. To compare postoperative analgesic requirement.
3. To assess early postoperative complications.
4. To evaluate short-term recurrence during follow-up.

Materials and Methods

This prospective study was conducted in the Department of General Surgery at District Hospital Kishtwar over a period of 36 months. A total of 60 patients diagnosed with inguinal hernia were enrolled in the study. These patients were randomly divided into

two groups, with 30 patients in each group. One group underwent open Lichtenstein mesh hernioplasty with mesh fixation, while the other group underwent the same procedure without mesh fixation. The outcomes of both groups were compared to evaluate early postoperative pain and related parameters.

Inclusion Criteria

- Age 18–70 years
- Primary unilateral inguinal hernia
- ASA Grade I–III

Exclusion Criteria

- Recurrent hernia
- Bilateral hernia
- Complicated hernia (obstructed/strangulated)
- Chronic pain disorders

Randomization: Patients were randomly allocated using computer-generated random numbers into:

- Group A: Mesh fixation with polypropylene sutures
- Group B: Mesh placement without fixation

Surgical Technique: All patients underwent standard open Lichtenstein tension-free hernioplasty under spinal anaesthesia. A lightweight polypropylene mesh of identical size was used in all cases.

Postoperative Pain Assessment: Pain was measured using the Visual Analog Scale (0–10).

Statistical Analysis: Data were analysed using SPSS version 20.0. Continuous variables were expressed as mean $\pm$ SD. An independent t-test was used for comparison. A p-value < 0.05 was considered statistically significant.

Results

Demographic Data: Both groups were comparable in age, gender distribution, and type of hernia.

Table 1: Demographic Characteristics Table

Variable	Mesh Fixation (n=30)	No Fixation (n=30)	p-value
Mean Age (years)	46.2 $\pm$ 12.3	44.8 $\pm$ 11.6	0.63
Male (%)	28 (93%)	27 (90%)	0.64
Female (%)	2 (7%)	3 (10%)	0.64
BMI	24.1 $\pm$ 3.2	23.7 $\pm$ 3.1	0.71
Hospital stay (days)	2.4 $\pm$ 0.6	1.9 $\pm$ 0.5	0.02

The baseline characteristics of patients in both groups were comparable. The mean age of patients in the mesh fixation group was 46.2 ± 12.3 years, while in the no fixation group it was 44.8 ± 11.6 years, and the difference was not statistically significant ($p = 0.63$). The majority of patients in both groups were male, with 28 (93%) males in the mesh fixation group and 27 (90%) males in the no fixation group, while females constituted 2 (7%) and 3 (10%) in the respective groups. The difference in gender distribution between the groups was not statistically significant ($p = 0.64$). The mean Body Mass Index (BMI) was 24.1 ± 3.2 kg/m² in the mesh fixation group and 23.7 ± 3.1 kg/m² in the no fixation group, with no significant difference ($p = 0.71$). However, the mean hospital stay was 2.4 ± 0.6 days in

the mesh fixation group compared to 1.9 ± 0.5 days in the no fixation group, and this difference was statistically significant ($p = 0.02$), indicating a shorter hospital stay in patients who underwent hernioplasty without mesh fixation.

Table 2: Types of Hernia

Hernia Type	Mesh Fixation (n=30)	Without Fixation (n=30)	Total	p-value
Direct Inguinal Hernia	12 (40%)	10 (33.3%)	22 (36.7%)	0.58
Indirect Inguinal Hernia	18 (60%)	20 (66.7%)	38 (63.3%)	0.58

The distribution of hernia types among the study participants was comparable between the two groups. In the mesh fixation group, 12 patients (40%) had direct inguinal hernia, while 18 patients (60%) had indirect inguinal hernia. Similarly, in the group without mesh fixation, 10 patients (33.3%) presented with direct inguinal hernia and 20 patients (66.7%) had indirect inguinal hernia. Overall, a total of 22 patients (36.7%) had direct inguinal hernia and 38 patients (63.3%) had indirect inguinal hernia in the study population. The difference in the distribution of hernia types between the two groups was not statistically significant ($p = 0.58$), indicating that both groups were comparable with respect to the type of inguinal hernia at baseline.

Table 3: Pain Scores (Mean $\pm$ SD)

Time	Fixation	Non-Fixation	p-value
12 hrs	4.5 ± 1.1	3.3 ± 0.9	<0.01
24 hrs	3.2 ± 0.9	2.5 ± 0.8	0.02
48 hrs	2.0 ± 0.7	1.8 ± 0.6	0.15

The comparison of postoperative pain scores between the fixation and non-fixation groups at different time intervals showed a reduction in pain in the non-fixation group during the early postoperative period. At 12 hours after surgery, the mean pain score in the fixation group was 4.5 ± 1.1 , whereas in the non-fixation group it was 3.3 ± 0.9 , and this difference was statistically significant ($p < 0.01$). At 24 hours, the fixation group had a mean pain score of 3.2 ± 0.9 compared to 2.5 ± 0.8 in the non-fixation group, which was also statistically significant ($p = 0.02$). However, at 48 hours postoperatively, the mean pain score was 2.0 ± 0.7 in the fixation group and 1.8 ± 0.6 in the non-fixation group, and the difference was not statistically significant ($p = 0.15$). These findings suggest that patients undergoing hernioplasty without mesh fixation experienced significantly less pain in the early postoperative period, particularly within the first 24 hours, while pain levels became comparable between the two groups by 48 hours after surgery.

Table 4: Complications

Complication	Mesh Fixation	No Fixation	p-value
Seroma	2	1	0.55
Hematoma	1	1	1.00
Wound infection	2	1	0.55

The occurrence of postoperative complications was comparable between the mesh fixation and non-fixation groups.

Seroma formation was observed in 2 patients in the mesh fixation group and 1 patient in the non-fixation group, and the difference was not statistically significant ($p = 0.55$). Hematoma occurred in 1 patient in each group, showing no difference between the two groups ($p = 1.00$). Similarly, wound infection was reported in 2 patients in the mesh fixation group and 1 patient in the non-fixation group, which was also not statistically significant ($p = 0.55$). These findings indicate that the rate of postoperative complications was similar in both groups, suggesting that performing hernioplasty without mesh fixation does not increase the risk of early postoperative complications.

Discussion

Early postoperative pain following Lichtenstein hernioplasty is multifactorial. Suture fixation may contribute to nociceptive stimulation due to tissue penetration and nerve irritation. Our study demonstrates a statistically significant reduction in early postoperative pain in the non-fixation group. The absence of increased complications suggests that mesh stability may be maintained by intra-abdominal pressure and proper placement without suturing in selected cases.

Limitations

- Single-centre study
- Short-term follow-up
- Long-term recurrence not fully assessed

Conclusion

Non-fixation of mesh in open Lichtenstein hernioplasty significantly reduces early

postoperative pain and analgesic requirement without increasing short-term complications. This technique may be safely adopted in selected uncomplicated inguinal hernia cases.

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